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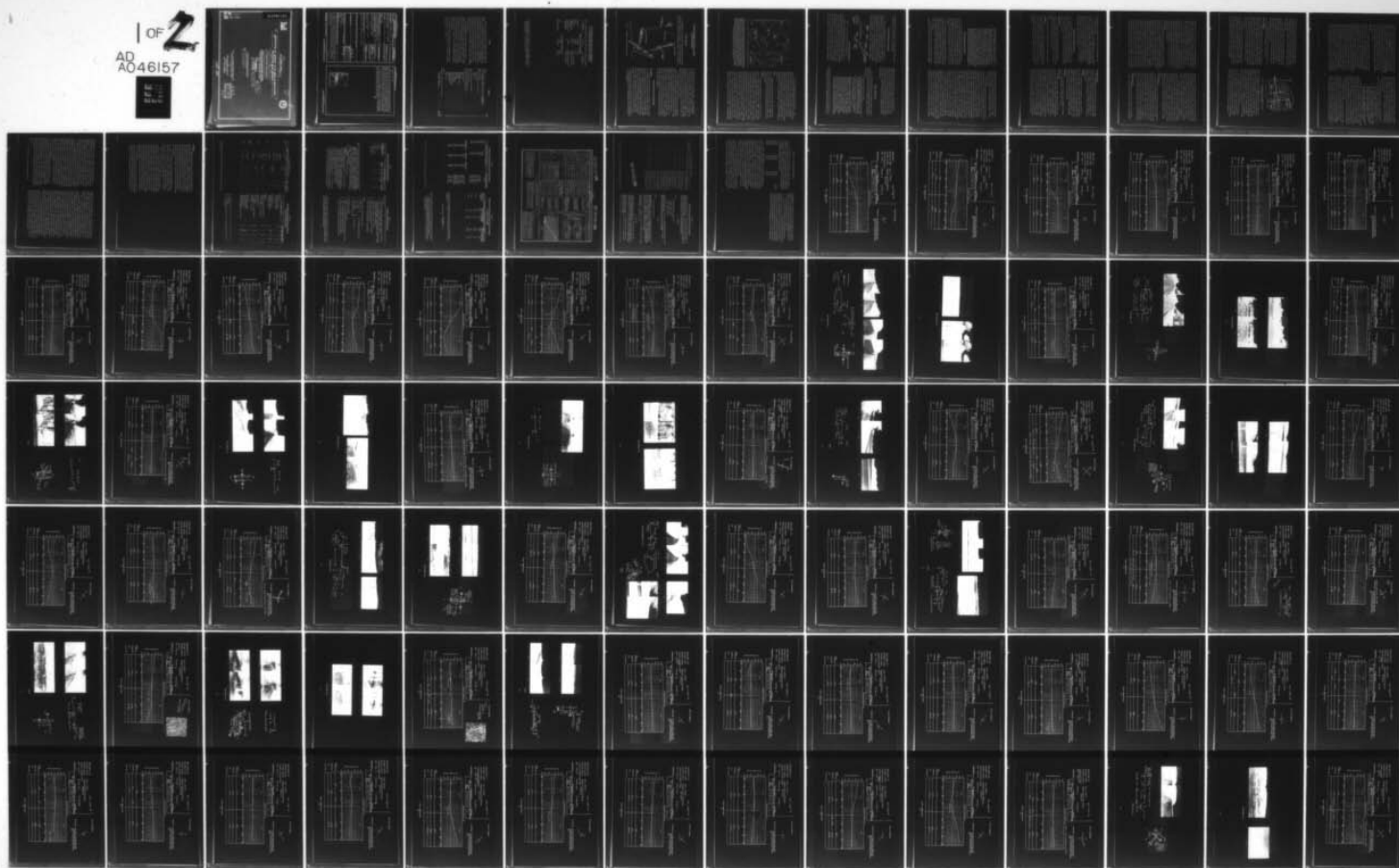
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DESCRIPTION OF TERRAIN TO BE USED IN EVALUATING THE LOFTED MINE--ETC(U)  
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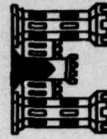
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DESCRIPTION OF TERRAIN TO BE USED IN EVALUATING  
THE LOFTED MINE CONCEPT.

10 Eugene E/Addor. Edward E/Garrett

by

Mobility and Environmental Systems Laboratory  
U. S. Army Engineer Waterways Experiment Station  
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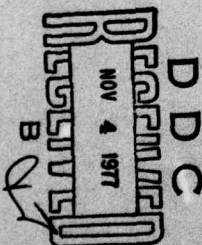
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20. ABSTRACT (Continued).

The data are presented on profile diagrams representing transects intersecting the road at right angles and extending 200 m to the right and left from the road center line. The data include a topographic profile along the transect line, slope orientation of the profile, and vegetation, soil, and roadway characteristics to the extent that the relevant data were inferable from the available data sources or from on-site inspection. Selection of the terrain characteristics for description was based on their presumed interactions with various functional phases of the proposed lofted mine system.

The data constitute information exhibiting the considerable variation found within the study area. Analysis of the data in terms of performance of the proposed mine systems can be made by inference or more adequately by use of quantitative performance prediction models.

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Preface

Personnel of the Mobility and Environmental Systems Laboratory (MESL), U. S. Army Engineer Waterways Experiment Station (WES), conducted the study reported herein during the period June-November 1974. The study was funded for the most part by the U. S. Army Materiel Systems Analysis Agency (USAMSA), Aberdeen Proving Ground, Maryland, by DA Form 2544, No. 75-A04, dated 15 July 1974. However, funds for the field work in Germany and for publishing the report were from Technical Effort E3, Terrain Operations Simulation of the U. S. Army Corps of Engineers Project 4AT627304T42. Mr. Frank Leopold of USAMSA monitored the program.

This study was under the general supervision of Messrs. W. G. Shockley, Chief, MESL; W. E. Grabau, Special Assistant, MESL (formerly Chief of the Environmental Systems Division (ESD)); and B. O. Benn, Chief, ESD. Mr. J. R. Lundien, ESD (formerly Chief, Environmental Research Branch), directed the study. Mr. Grabau conducted the field work in West Germany, and Messrs. E. E. Addor, Aquatic Plant Research Branch, ESD, and E. E. Garrett (now retired) assembled the data and prepared the report.

Directors of the WES during the study and preparation of this report were COL G. H. Hilt, CE, and COL J. L. Cannon, CE. Technical Director was Mr. F. R. Brown.

Contents

	Page
Preface . . . . .	1
Conversion Factors, Metric (SI) to U. S. Customary and U. S. Customary to Metric (SI) Units of Measurement . . . . .	2
Purpose and Scope . . . . .	3
General Description of the Study Area . . . . .	3
Physiography . . . . .	3
Soils . . . . .	4
Climate . . . . .	4
General Description of the Road Net . . . . .	5
Sample Site Selection . . . . .	5
Data Requirements and Acquisition . . . . .	6
Explanation of the Sample Site Data . . . . .	7
Sample number . . . . .	7
Date . . . . .	7
Map number . . . . .	7
Coordinate location . . . . .	7
Landscape . . . . .	7
Road class . . . . .	7
Road direction . . . . .	8
Road site type . . . . .	8
Road construction . . . . .	8
Topographic profile . . . . .	8
Slope orientation . . . . .	9
Vegetation . . . . .	10
Soil . . . . .	11
Microrelief . . . . .	12
Tables 1-9	
Appendix A: Roadside Terrain Descriptions . . . . .	A1
Site Profile Data . . . . .	A2-A189
Supplemental Photographs . . . . .	A150-A152

Conversion Factors, Metric (SI) to U. S. Customary and  
U. S. Customary to Metric (SI) Units of Measurement

Units of measurement used in this report can be converted as follows:

<u>Multiply</u>	<u>By</u>	<u>To Obtain</u>
<u>Metric (SI) to U. S. Customary</u>		
centimetres	0.3937007	inches
metres	3.280839	feet
kilometres	0.6213711	miles (U. S. statute)
grams per cubic centimetre	62.42797	pounds (mass) per cubic foot
neutrons per metre	0.7375621	pounds (force) per foot
Celsius degrees or Kelvins	1.8	Fahrenheit degrees*
<u>U. S. Customary to Metric (SI)</u>		
feet	0.3048	metres
degrees (angular)	0.01745329	radians

\* To obtain Fahrenheit (F) degrees from Celsius readings, use the following formula:  $F = 1.8(C) + 32$ . To obtain Fahrenheit readings from Kelvins, use:  $F = 1.8(K - 273.15) + 32$ .



# DESCRIPTION OF TERRAIN TO BE USED IN EVALUATING THE LOFTED MINE CONCEPT

## Purpose and Scope

1. The purpose of this study was to describe terrain in a selected area in West Germany to be used by the U. S. Army Mobility Systems Analysis Agency in evaluating the lofted mine concept. As shown in Figure 1,

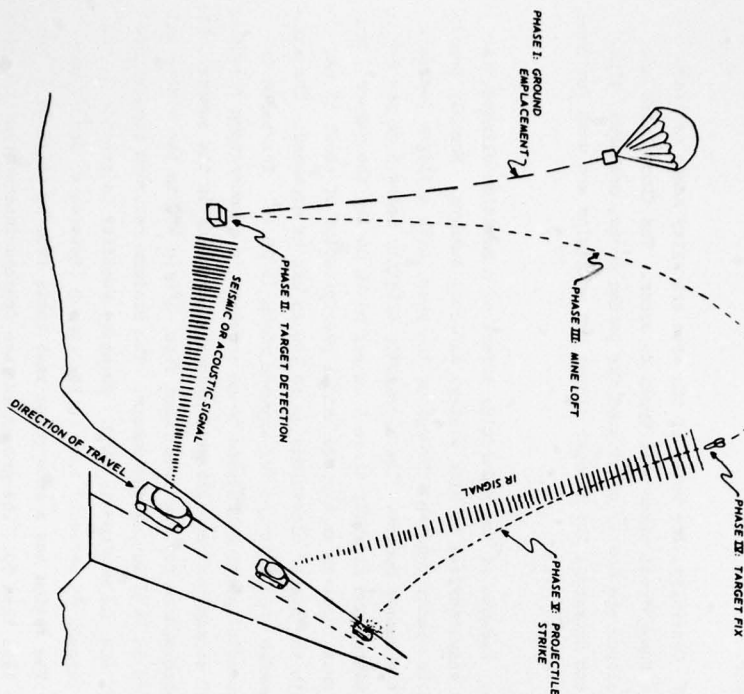


Figure 1. Illustration of proposed mine concept

the concept involves five functional phases: (a) ground emplacement, (b) target detection (by seismic or acoustic signal), (c) mine loft, (d) target fix, and (e) projectile strike. The specific requirement was for a set of site descriptions representing the range of variations in road and roadside terrain conditions within the area. Emphasis in this requirement was on the idea of realism, i.e. entirely possible and highly probable combinations of terrain conditions, as distinct from real, i.e. exact truth as to actual existing conditions.

2. Terrain information on 104 sites (Appendix A) was obtained by inference from conventional topographic maps and available aerial photographs, and from on-site photographs and field notes taken by U. S. Army Engineer Waterways Experiment Station (WES) personnel who were in Germany on another assignment while this study was in progress. This document contains: (a) a general description of the study area, (b) a general description of the road net within the study area, (c) an explanation of the sample site selection procedure, (d) a brief discussion of problems relating to data acquisition and presentation, and (e) definitions of terms and explanation of specific data items shown on the profile data sheets in Appendix A.

## General Description of the Study Area

### Physiography

3. The prescribed study area is circular with a radius of 75 km\* and is centered on the divide between the watersheds of the Main River and principal tributaries of the Weser, at a point approximately 60 km northeast of Frankfurt-Am-Main and 35 km west of Fulda, in West Germany (Figure 2). The principal physiographic features are floodplains and gentle hills. Elevations range generally between 200 and 500 m, with some river valleys less than 200 m (minimum about 95 m at Frankfurt) and some peaks in the central portion of the area exceeding 700 m (maximum of 773 m, on Taufstein, very near the center of the area).

\* A table of factors for converting metric (SI) units of measurement to U. S. customary units and U. S. customary units to metric (SI) units is given on page 3.

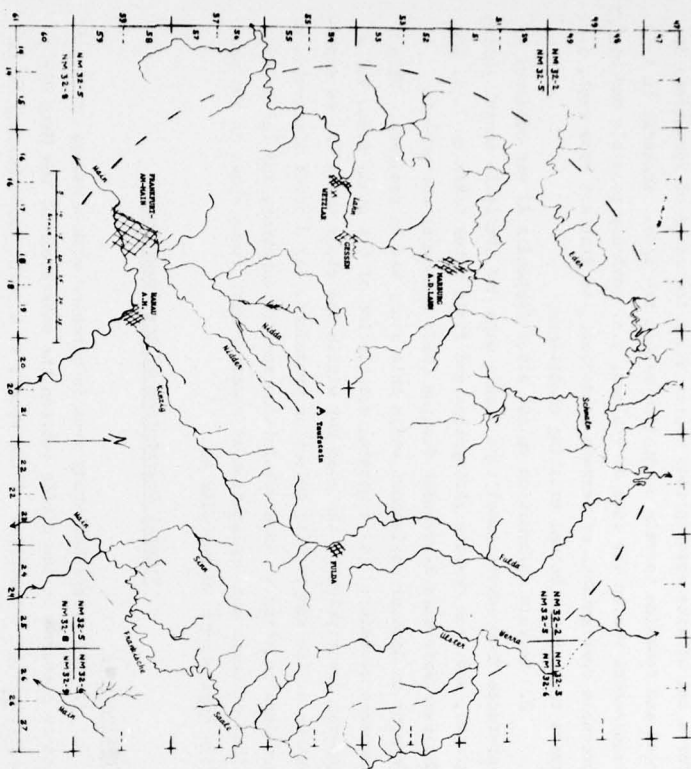


Figure 2. Index map of the study area, based on the Militargeographische Dienststelle Series M-501 Universal Transverse Mercator Grid Zone 32 (original scale 1:250,000). (The numbers outside the margin denote the map numbers for Series M-745 at 1:50,000; the numbers inside the margin denote the map numbers for the corresponding 1:25,000 topographic maps by the Hessisches Landesvermessungsamt. Read the right margin first; for example, Weizlar is shown on map number 15516 of the series at 1:50,000, and on numbers 5416 and 5417 of the 1:25,000 scale maps. Large dashed circle is approximate limits of the study area.)

4. The basic drainage system is shown in Figure 2. In the southern and western portions, drainage is primarily via the Main River and its tributaries, the more important of which are the Frankische Saale skirting the study area on the extreme southeast, the Kinzig, Nidder, and Nidda draining the south-central portion, and the Lahn draining the western quadrant. North of the divide, the Eder, tributary to the Fulda, flows eastward across the extreme northwestern portion of the area; the Schmalm is tributary to the Eder and drains the north-central portion; and the northeast quadrant is drained by the Fulda and the Unster.

#### Soils

5. Generally, the soils of the area are silty sands or sandy silts, although most other soil types do occur. The floodplains and gentle slopes are mostly cultivated for garden crops, orchards, vineyards, and hopyards; the steeper slopes and mountains are used for commercial forest.

#### Climate

6. Because of the moderating effect of a maritime climate, the area is characterized by mild winters and cool summers. Monthly precipitation is nearly constant throughout the year, with a slight increase during the summer months. The average is slightly below 5 cm per month in the winter and slightly above 5 cm per month during the summer. Most of the area receives an average annual precipitation of about 55 cm, although in the higher elevations up to 100 cm can be expected. The maximum recorded precipitation for any one month is 20 cm. Increases in summer precipitation correspond to an increase in thunderstorm frequency, about 20 storms per year with the majority occurring in the summer. The mean temperatures for the area range from  $-1^{\circ}\text{C}$  to  $4^{\circ}\text{C}$  in the winter and from  $10^{\circ}\text{C}$  to  $24^{\circ}\text{C}$  during the summer. The minimum recorded temperature is  $-23^{\circ}\text{C}$  and the maximum is  $38^{\circ}\text{C}$ . Relative humidity is greater in the winter (around 85 percent) than in the summer (between 65 and 70 percent). The region has a snow cover that lasts from 20 to 70 days, but usually less than 50. The ground surface freezes intermittently during the winter, but normally to only a few centimetres. The average number

of cloudy days per year exceeds 200. During the winter months, dense fogs commonly occur decreasing visibility considerably.

### General Description of the Road Net

7. The use of standard maps and air photos for information sources limits the kinds of information that can be obtained on road construction materials and design specifications. For this study, the roads in the study area are grouped into five classes based upon conventional mapping criteria. The requirement for realism rather than on-site accuracy allows for some generalization without loss of utility for the present purpose. A cross section showing the range of typical design configurations for surfaced roads is diagrammed in Figure 3.

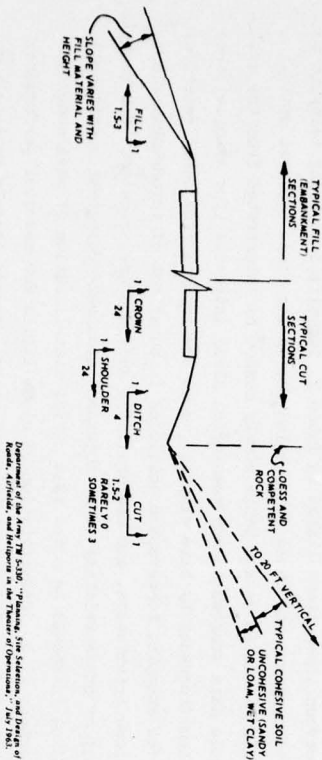


Figure 3. Typical road cross-section characteristics

8. The five road classes defined for this study in Table 1 are: dual highways (including autobahns), trunk roads, secondary roads, light-duty all-weather roads, and farm and forest roads. The autobahns differ from other dual highways in that they have limited access, the median strip is at least 4 m wide (but may be wider) (analogous to the interstate highways in the U. S.), while access to other dual highways may or may not be controlled, and the median strip may be less than 4 m wide (but also may be wider). The two lanes in either case may be on separate alignments. In addition, there are two typical construction

specifications that may be used for class 1 roads, depending upon whether the surface is concrete or asphalt.\* Hence, in Table 1, sub-classes a and b are defined for this class, but these are not distinguished in the site description data since they are not distinguished on conventional maps. The seismic characteristics of the two subgroups would probably be significantly different; for example, seismic energy will couple more readily with asphalt but will propagate more readily through concrete.

### Sample Site Selection

9. Within the prescribed study area, sample sites were selected according to an a priori set of rules designed to ensure equal probability that all relevant terrain factor combinations would be represented in the survey.

10. The selection procedure was as follows:

- a. A composite index map sheet was compiled for the 1:50,000- and 1:25,000-scale topographic map series by U. S. Army Research-Europe (USAREUR) Engineer Topographic Center, and equivalent German agencies covering the study area.
- b. On each grid square representing a 1:50,000 sheet that covered any portion of the study area, the geometric center of the northeast quadrant was located.
- c. Starting at the top center of the circular study area (see paragraph 3) and progressing left to right along the grid rows to the bottom of the circle, a line was drawn from the center points (established in b above) to the north, northeast, or east, in turn, on each such quadrant that fell one half or more within the boundary of the study area circle. The purpose of alternating the direction of these transect lines was to avoid biasing the selection of samples with the "topographic grain" of the country, if any. For this reason, when the prescribed line of direction in any grid square on a row was the same as the directional sequence was adjusted immediately above, the directional sequence was adjusted (i.e. by skipping to the next direction), so that no two

\* The term "concrete" means only portland cement concrete, while the term "asphalt" means a mixture of aggregate with any asphaltic binder.



adjacent grid squares were transected in the same direction. (This adjustment was required on two rows.)

- d. These a priori transect lines were transferred from the index grid sheet to the corresponding 1:50,000- or 1:25,000-scale maps (the latter were always used when available). Starting at the point of origin of each of these lines (i.e. at the center point of the northeast quadrant of the 1:50,000-scale map, or the center of the 1:25,000 maps), and moving outward along the directed line, a site was established at the first encounter with a road of any class (as defined in Table 1) not within a village or urban area. At that point a line was drawn perpendicular to the road, and that line marked the location and direction of a topographic profile traverse line. The next site was selected by proceeding along the directed transect line to the first encounter with a road of any other class and drawing a profile traverse line perpendicular to the road at that intercept. This procedure was continued until one sample was located for each road class encountered along the prescribed transect line from the center of the map to the map boundary.

#### Data Requirements and Acquisition

11. Time and scope limitations on this study required that specific site descriptive data be obtained from readily available maps and photographs. The sponsor requested additionally that site descriptions be presented in the form of profiles perpendicular to the road and extending to a distance of 200 m on each side. These constraints posed several problems in data acquisition and data presentation, two of the more important being informational content of the data sources, and scale.
12. A minimal list of environmental factors that appear to be relevant to an evaluation of the proposed mine concept is presented in Table 2. This list was compiled from a careful consideration of the tentative functional characteristics (Figure 1) of the proposed mine system in relation to known interactions between terrain and similar kinds of material systems, or material systems employing similar functional components.
13. The mine system concepts to be evaluated with these data require that, in addition to the surrounding terrain, the roadways

themselves be defined as part of the terrain system, since roads have seismic and acoustic characteristics different from native terrain, according to their material content and structural details. Table 2 therefore also includes a list of attributes of roads that are relevant to the present problem.

14. The form that was developed for presenting the data derived from interpretation of the maps and photographs available for this study is that used in Appendix A. The central feature of the form is the topographic profile, drawn at a scale exaggerated from the map scale, and supplemented by descriptive information on other relevant environmental factors in such a way that association of class values for the various selected factors is immediately evident upon inspection of the recorded data. Examination of the data form reveals some discrepancies between those items listed in Table 2, identified as being relevant to the purpose, and those data called for on the form. Several of the factors listed on the table simply cannot be interpreted from the available data sources in any meaningful class intervals (for example, tree stem frequency by size classes), some are derived from other relations (for example, topographic shielding is an effect of topographic slope, slope orientation, and microrelief), and some are transient (for example, all of those relating to or dependent upon meteorological conditions). Also, it should be noted that useful classification of environmental factors (i.e. identification of class limits for material performance evaluation including concept evaluation) depends largely on knowledge of specific physical and functional characteristics of the material.
15. The problem of scale can best be appreciated by realizing that at a scale of 1:25,000 (the maximum scale of the available topographic maps and the approximate scale of the available aerial photographs), a distance of 200 m on the ground is less than 1 cm on the map or photograph. A topographic profile drawn at this scale cannot include the detail of topographic shielding, microrelief, and vegetation that is necessary for an evaluation of the functional aspects of the proposed mine concepts. For this reason, the profiles had to be drawn at an exaggerated scale, which has the disadvantage, however, of providing

the capability for presenting detail that is not interpretable from the available data sources.

16. A lesser problem of data presentation for this study relates to the choice of presentation mode. A map is capable of showing both vertical (by symbol) and horizontal relations on a two-dimensional plane, i.e. an area; whereas, a profile shows vertical phenomena graphically but is restricted to showing horizontal relations only along a line. Even so, a profile has a conspicuous advantage over a map display, especially for the present purpose, because the vertical relations are more readily perceived on a profile than on a map, and proposed mine systems operate mostly in the vertical plane.

#### Explanation of the Sample Site Data

17. This section explains the items of information on the data sheets (Appendix A) in approximate order of appearance thereon. Each discussion is complete with rationale, formal definition (when appropriate), procedure used for obtaining the information from the available maps or air photos, and explanation for the omission of some of the data called for on the sheets.

#### Sample number

18. The sample sites are numbered sequentially in the order selected. The sequence therefore starts near top center of the circular study area and continues thence left to right across the rows of map sheets to the bottom center of the circular area.

#### Date

19. Day, month, and year when the data were compiled are listed.

#### Map number

20. For this study, all maps were prepared by USAREUR Engineering Topographic Center and the Hessisches Landesvermessungsamt and are identified by the map number. The maps are at scales of 1:50,000 and 1:25,000 (the former being distinguished by the letter L being prefixed to the identification number), with contour intervals of 10 m and supplemental contour intervals at 5 m and sometimes 2.5 m. The publication dates vary.

#### Coordinate location

21. The geographic coordinates for the site are given by longitude and latitude in degrees, minutes, and seconds, estimated by interpolation. Space is provided on the data form for recording the site location according to the Universal Transverse Mercator (UTM) grid coordinates (or other coordinate system), but these are not recorded in the present study.

#### Landscape

22. The purpose of this information is simply to provide the user with a mental image of a landscape within which to view the profile data. It is not intended at this time to have other analytical value, though landscapes could be classified for statistical evaluation. The information consists of a brief narrative description (about two to five words) of the general landscape through which the road passes at the sample site location; for example, cultivated floodplain, cultivated floodplain and forested slope, wooded upland.

#### Road class

23. The road class at the sample site is identified (see paragraphs 7 and 8) according to the definitions in Table 1.

#### Road direction

24. Because the profile transect extends on both sides of the road, and because there is some convenience in referring to these extensions as left and right, it is necessary that the viewing direction along the road be known. In addition, if the direction of the road at the sample site location is recorded, it is possible that the directional data could be analyzed for trends that will relate to the regional topographic "grain." For these purposes, it is necessary that a road be regarded as having only one direction. The direction of a road at the transect sample site is defined in accordance with the mapping convention that north is toward the top of the map sheet. Thus, the direction of a road is defined as the compass bearing of the road toward the north (north of west) or east, i.e. a road bearing exactly east-west at the sample site is designated to be directed east, while a road bearing in any other direction is designated to be directed

toward the north. The map reader (or in a field sampling program, the surveyor) faces to the north or to the east on a road and the segments (limbs) of the profile transect on his left and right hands are designated as left and right, respectively. If the sample point is on a curve in the road, the direction of the road at that point is designated as the direction of the tangent to the curve at that point.

25. For the present purpose, it is considered sufficient for the road direction to be given in terms of the traditional designators for major points of the compass (NW, N, ...E), by approximation only. (NOTE: The person who collected the on-site photographs and cross-sectional detail included in Appendix A was not instructed on this convention. Consequently, there are cases where none of the photographs are correctly oriented to the topographic profile as shown on the data sheet. By convention, the first photograph, or first stereo pair, at each site should have been so oriented.)

#### Road site type

26. The placement of the road with respect to the topographic surface on which it is situated determines to a large extent the topographic details of the roadbed cross section, depending on the engineering specifications of the road (i.e. the road class), and determines the exposure of the road to observation from the adjacent terrain. Knowledge of the topography at the site would thus provide a basis for evaluating the potential terrain shielding of the road, or the potential vulnerability of an object on the road to attack. The general topographic setting of the road at the sample site can be classified according to the general geometric shape of the topographic profile at the site, but an attempt to include in the site type classification the roadbed elevation with respect to the native surface (i.e. cut, fill, on grade, etc.) was not successful. Although such a classification was easily enough achieved (Table 3), its application was not, since the details of the roadbed cross sections are not available from the maps and photographs that were available for this study. In general, deep road cuts and fills are shown on maps as topographic features (generally as escarpments or bluffs), and the depth of cut or fill can sometimes be

approximated by interpolation between contour lines. The map interpolation techniques, while simple in principle, require some practice, and the time limitations for this study precluded the development of a suitable rationale and the acquisition of skills necessary to use this concept in the profile data. A road traversing a marsh or wetland is usually on a fill (embankment), but the height of the fill is usually much less than a contour interval on these maps, and not of sufficient height as to appear as a topographic feature on our photographs.

27. For this study, then, road site type is identified only according to the general topographic profile configuration, as classified in Table 3, and is indicated by a single digit in this space on the profile data sheets. In some instances, as when a reversal occurs in the profile curve, the site type is designated for the left and right limbs of the profile, respectively. (Example: 3/2 indicates a concave profile to the left of the road and a convex profile to the right.) On the diagrams all profiles are depicted with the road assumed to be on a typical simple bench or on grade, and the roadbed width is not drawn to scale.

#### Road construction

28. The road construction information requested on the data form is not available from standard topographic maps or from the aerial photos used in the study, and therefore this information is omitted from the profile data sheets, except that some data (surface materials, width of traffic lanes, and shoulder width) are given for some of the sites that were field-inspected. However, typical construction details for the defined road classes are shown in Table 1, which may be used to surmise the construction details at any site. If true information on the construction of the road at any specific site later becomes available, as, for example, from field observation or from engineering drawings or specifications, that information should be entered on the data forms.

#### Topographic profile

29. The topographic profile shows the slopes and elevations, relative to the road center line, along a transect line perpendicular



to the direction of the road (as defined above) at the sample site.

Note that these profiles represent the surface configuration along a single line perpendicular to the road, and do not necessarily represent the maximum topographic slope toward or away from the road at the site. This latter relation is defined as slope orientation, explained in paragraphs 32-34 below.

30. The profiles were compiled from topographic maps by scaling the distance between intercepts of the profile traverse lines with the topographic contour lines. On profiles derived by this procedure, the elevation interval is equal to the contour interval, the horizontal interval is dependent upon the slope, and the slope is assumed to be uniform between contour lines, even though on the ground slope variations approaching (but not exceeding) the contour interval may occur anywhere between the contour lines.

31. The contour interval on the maps used for this study is 10 m, with 5 m and sometimes 2.5-m supplemental contour intervals.

#### Slope orientation

32. Slope orientation is defined as the aspect of the slope expressed in relation to the direction of the road. Slope orientation is measured as the angle between the line of maximum downslope and the profile traverse line, turned toward the road (Figure 4). The reason for defining slope orientation in this way lies in the context; i.e. rather than viewing the slope from the road, the road is viewed from the slope, which is the perspective from which the lofted mine would have to operate. If there is no slope, or if the slope is negligible, orientation as here defined does not exist and is recorded on the data form as "N/A" or "NONE."

33. By definition, a slope orientation angle may equal but may never exceed 180 deg. A slope orientation angle of less than 90 deg will indicate a slope facing toward the road, with 0 deg being a slope directly facing the road (contour lines parallel to the road); a slope orientation angle of more than 90 deg will indicate a slope facing away from the road, with 180 deg being a slope faced directly away. For slope orientation angles from 0 to 90 deg, an object launched

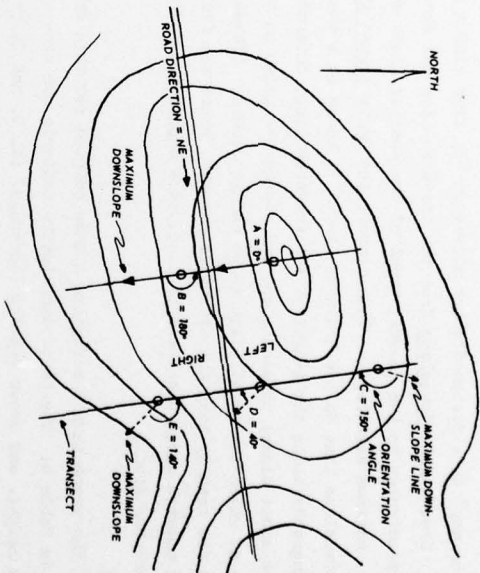


Figure 4. Definition of slope orientation angle with examples A through E

normal to the slope plane will approach the road in the direction of slope, or as viewed from the road, at a horizontal angle that is the complement of the slope orientation angle, since these are the base angles of a right triangle defined by the road, the traverse line, and the downslope line. For slope orientation angles greater than 90 deg, an object launched normal to the slope plane will be directed away from the road at a horizontal angle equal to the orientation angle minus 90 deg. The slope orientation is independent of the true topographic slope, as measured relative to the horizontal, but the greater the slope the greater is the significance of the orientation.

34. At the scale of the maps used for this study (1:25,000 and 1:50,000), it was impractical to estimate the slope orientation more than once on each 200-m limb of the traverse, except when the traverse encountered extreme variation in topography, such as a slope reversal (as at a ridge or valley), a cliff, or the like. The instructions given for determining slope orientation were as follows (see examples A

through E in Figure 4): From the road, move outward along the traverse limb (on the map) to a distance about midway on the limb (100-m ground distance). Draw a line downslope from the traverse line and approximately perpendicular to the general trend of the contour lines at that point (i.e. maximum downslope). Then measure the angle toward the road from the downslope line to the traverse line. If there is a sharp break in the topography along the length of the traverse limb, determine slope orientation about midway on each slope and record the point on the traverse limb at which the significant slope change occurs. (These instructions are readily adaptable to field surveys, where the fieldman would walk outward along the traverse line, face downslope, and turn the angle toward the road.)

#### Vegetation

35. The vegetation description scheme adopted for this study is presented in Table 4. The basic descriptive criteria are crown type, vegetation height, and crown spacing (coverage) (A, B, and C, respectively, on the table), and the vegetation along the profile traverse line is identified by a set of three numbers representing classes of these descriptive criteria, in that order. Six crown types are recognized and numbered more or less according to potential relative height growth (i.e. relative height of the type when fully mature). There are six height classes and five crown spacing classes recognized, but these (for the sake of simplifying the present problem) are not all independent of crown type. Thus, any land area with vegetation less than 10 cm tall is defined as barren and recorded as class 1 for all three descriptive criteria (i.e. described as type III); herbaceous vegetation (crown class 2) is intended to include grasslands and field crops, including forage crops, and is always presumed to be height class 2 or 3, according to the height of the crop at maturity; and shrubs (crown class 3) are intended to include any and all woody vegetation currently in height class 2 or 3, regardless of crown shape or branching habits and regardless of its potential for increased height growth. Only plants more than 3 m tall, and all such plants regardless of crown shape or branching habit, are considered to be trees; in this

scheme only three height classes are applicable to trees. Of the five crown spacing (coverage) classes, class 1 is reserved for crown type class 1 (barren), but the others apply to all crown type and height class combinations. The percentage values shown for the crown spacing classes in the table are crude approximations of the mathematical relations between the areal concept of coverage and the linear concept of spacing as defined.

36. By the definitions, 52 descriptive class combinations are allowed in the scheme (Table 5). Some typical examples follow:

- a. For a conifer forest, estimated to be about 25 m tall, with a closed canopy, the designation is 665.
- b. For a mixed broadleaf-conifer stand, estimated to be 15 m tall, spaced 3-5 crown diameters, the designation is 533.
- c. For a potato field (height less than 1 m), with spacing between the rows about equal to the row crown width (50 percent coverage), the designation is 224.
- d. If a traverse crosses a pasture (grass, 10-90 cm tall) and then enters a stand of hardwood trees 10 m tall with a closed canopy, vegetation designation is 225/555.

37. If there is a significant (sharp and easily recognized) change in vegetation type along the length of the traverse, the point on the traverse (distance from the road) at which the change occurs is marked on the data sheet, and the vegetation type is identified on both sides of the mark (example d above). If part of the required data for a vegetation type is not available (e.g., crown type is identified from the map as coniferous, but photographs are not available for other data), an X is placed in the number set to fill the position normally occupied by the missing descriptive class value.

38. Note that in this scheme, crown spacing is defined in terms of crown diameters. That is, the distance between the margin of one plant crown and the next is measured in multiples of the (average) crown diameter (in practice, visually averaged distances and diameters for the stand are used, rather than absolute measurements of specific trees). This definition of spacing is entirely relative and does not include absolute values for either crown diameter or crown spacing; the value of the definition lies in the ease with which spacing can be

estimated from the air photos, since it is entirely independent of photograph scale or plant size. Further, the relation between percentage of crown cover and crown spacing by this definition is constant, regardless of crown diameter. However, the forests within the study area are mostly intensively managed, well-groomed stands that are relatively homogeneous with respect to tree dimensional relations and composition. The relations between the classification criteria used in this classification scheme and other dimensional characteristics that are relevant to the purpose of this study may be inferred from Table 6.

39. The vegetation descriptive classes defined here are numbered according to presumed increasing deleterious effect on the function of the proposed mines. Thus, other conditions being equal, type 665 would represent the most difficult situation in which the mine system would be expected to operate. The effect of vegetation on the performance of the proposed mine will of course depend on a complex set of relations among the vegetation itself, the vegetation in relation to topography, and the mechanical properties of the mine. The vegetation descriptive scheme used here is intended to provide alternative descriptors (by inference or by correlation) that are required for the WES missile trajectory model, which predicts the performance probabilities of a missile as a function of vegetation, topography, and the physical and mechanical characteristics of the missile.

40. Species identification was not attempted for this study, since species are not normally identifiable from either conventional topographic maps or air photos, except by persons intimately familiar with the forests and crops of the region under consideration. For a field data collection program or a more intensive literature research, provision would be included on the data form for recording at least the one or two species that predominate in the stand at each site. Certain vegetation characteristics that are useful in some material performance prediction models, such as mechanical properties of wood, are related to species.

#### Soil

41. Soil information is recorded on the data sheets in a

combination of letter and number codes. The letter code (two letters) identifies the soil type according to the Unified Soil Classification System (USCS) shown in Table 7. The number code, from 1 to 21, identifies a specific combination of soil and road factors that affect the generation and propagation of seismic energy from vehicles, as listed in Table 8. The factors listed in Table 8 are defined in Table 9.

42. The basic information concerning soil properties was derived from pedological and geological maps published by West Germany governmental agencies. This information was supplemented by correlation of soils with topography and land use, as interpreted from aerial photographs and topographic maps. The derived information was interpreted for each site to arrive at the probable soil classification according to the USCS. The accumulated information was then used to identify the seismic factor classification from Table 8. This is an abstracted version of a more expansive list developed as part of a study (by the WES) of seismic signals from vehicles. The listing in this table includes those combinations of soils considered most likely to occur with the highest frequency in the study area and bracket the expectable range of seismic performance from the most to the least favorable. Since soil characteristics at the sample sites had to be inferred from the maps and photographs, and the correlation of these inferences with the terrain types estimated, as listed in the table, this presentation of seismic properties must be viewed as probabilistic rather than factual. Precise determination of the engineering and seismic propagation characteristics can be achieved only by means of on-site investigations that would include sampling and seismic refraction surveys.

43. This soil description scheme does not include temporal qualities of soil except as these are related to the descriptive criteria included in the USCS. Thus, soil penetrability, for example, is related to plasticity and to the presence of stones, which criteria are used in the USCS, but it is also related to recent rainfall history and the effects of recent cultivation, which criteria are not used in the USCS and therefore are not included in these descriptions.



#### Microrelief

44. Microrelief will affect the operation of the proposed mine systems through its relation to topographic shielding, its effect (if any) on seismic or sonic wave propagation, and its effect on emplacement orientation of the functional unit of the mine. However, microrelief data are not inferable from the data sources used for this study, and time limitations precluded research of other sources for useful data. For this reason microrelief data are not listed on the data sheets. A brief narrative description of relevant microrelief characteristics follows, from which performance requirements of the proposed lofted mines may be inferred.

45. On cultivated lands, typical microrelief features are of three types: (a) a series of parallel furrows or undulations, usually following the topographic contours; (b) randomly dispersed soil clods up to a few (10-15) centimetres in diameter strewn on an otherwise uniform soil surface; and (c) such randomly dispersed clods strewn on a furrowed or undulating soil surface, type (a).

46. In forests, typical soil surface microrelief features are probably not as important to the function of the proposed mines as are the pseudomicrorelief features created by ground vegetation and stumps. Logging debris is not a critical problem in this area, since the forests are gleaned for maximum utility, and most of the debris is therefore included as part of the product. Some of the forested land is essentially without ground cover vegetation; it may be quite smooth and carpeted with leaf and twig litter or sometimes strewn with cobblestone. The on-site photographs and microprofile sketches accompanying some of the data sheets illustrate the varieties of surface microrelief and ground-cover conditions that may be expected in various topographical and land-use contexts.

47. The data sheets provide space for notes and comments. This space is used for supplementary notes, and especially for sketching the site plan, including the road direction and curvature at the site and the location of the traverse line with respect to road curvature.

Table 1  
Road Classification and Description

Class	Layer	Thickness mm	Material*	Width m	Shoulder Width m	Median Width m	Ditch Width m	Minimum Total Right Width, m	Estimated Total Length Within Study Area, km
Dual 1(a)	1	20	Concrete	7.5 x 2	3-4 Asphalt or concrete	4	2	20 x 2	185
1(b)	2	30	Sand, gravel, or crushed stone	6 x 2 Asphalt, con- crete, or gravel	3-4	1	2	18 x 2	
	3	In situ soil							
	1	8 Block	Asphalt (or stone block)						
	2	20	Gravel or crushed stone						
Trunk 2	3	40	Sand or gravel	6 x 2 Asphalt, con- crete, or gravel	3-4	1	2	18 x 2	
	4	In situ soil							
	1	4-6	Asphalt or stone block						
	2	15	Gravel or crushed stone						
Secondary 3	3	20	Sand or gravel	6 x 2 Asphalt, con- crete, or gravel	3-4	1	2	18 x 2	
	4	In situ soil							
	1	1-2	Asphalt						
	2	10	Sand or gravel						
Light-duty all- weather 4	3	In situ soil	6 x 2 Asphalt, con- crete, or gravel	3-4	1	2	18 x 2		
	2	10						Sand or gravel	
	1	15-20						Gravel or crushed rock	
	2	In situ soil							
Farm and forest 5	1	0-5	None, or gravel	6 x 2 Asphalt, con- crete, or gravel	3-4	1	2	18 x 2	
	2	In situ soil							
	1	15-20	Gravel or crushed rock						
	2	In situ soil							

\* The term "concrete" means only portland cement concrete, while the term "asphalt" means a mixture of aggregate with any asphaltic binder.

Table 2  
Environmental Factors Required for Evaluation  
of the Lofted Mine Concepts

Environmental Factor	Mine Functional Phase*				
	I	II	III	IV	V
Meteorology					
Wind speed, direction	X**	X	-†	X	-
Ambient temperature	-	-	-	X	-
Precipitation or haze	-	-	-	X	-
Surface geometry					
Topographic slope	X	(X)††	X	(X)	-
Topographic shielding	-	X	-	-	X
Surface microrelief	X	-	X	(X)	-
Vegetation					
Height	X	-	X	X	X
Crown (twig and leaf mass) density	X	X	(X)	X	X
Branching habit	X	-	(X)	-	X
Stem or branch size and frequency	-	-	X	-	X
Surface composition					
Soil type	X	X	-	-	-
Soil moisture	X	X	X	-	-
Soil compaction (include freezing)	X	X	X	-	-
Snow cover	X	X	X	-	-
Subsurface soil layering	-	X	-	-	-
Road design					
Road surface material	-	X	-	-	-
Road subgrade material	-	X	-	-	-
Road surface width	-	(X)	-	-	-
Shoulder width	-	(X)	-	-	-
Median strip width	-	(X)	-	-	-
Bank and embankment height and slope	X	(X)	X	X	-

\* See Figure 1.  
 \*\* X = critical.  
 † - = minor or undetermined relevance (depending upon design concepts).  
 †† (X) = important.

Table 3  
Road Site Type Classification (tentative)

Topographic Profile Configuration	Road Bed Location				
	1	2	3	4	5
	On Grade	Fill	Cut	Part Bench	Full Bench
1. Flat	X*	X	X	-**	-
2. Convex	X	X	X	X	X
3. Concave	X	X	X	X	X
4. Slope, gentle	-	X	X	X	X
5. Slope, steep (cliff)	-	-	-	-	X

Note: A road site type is defined by a two-digit number identifying the topographic profile configuration and the roadbed location, respectively. Examples: A road on a fill (embankment) through a swampy area is type 12 (flat topographic profile, road located on fill); a road breaking over the toe of a ridge often has site type 23, whereas a road cresting through a ridge (usually at a "saddle," or low point on the ridge) will often have site type 33.

\* X = probable combinations.  
\*\* - = improbable or impossible combinations.

#### Definitions

On Grade is roadbed at base topographic elevation, or raised only for sufficient drainage.  
Fill is entire roadbed raised on a solid base (i.e. not on piers) at least a metre, and often much more, above the base topographic elevation. Fill materials vary considerably, from soil or gravel to large rock, and may be obtained locally or transported from rather distant locations.  
Cut is entire roadbed below the topographic elevation, with a cut bank on both sides.  
Part Bench is roadbed cut on one side and filled on the other. It is often used on gentle slopes.  
Full Bench is roadbed cut into the slope for its full width, so that there is a cut bank on one side, but no fill on the other. This is the usual construction on steep slopes.

Table 4  
Vegetation Classification Criteria

- A. Crown Type
  1. Barren (vegetation none, or less than 10 cm tall; permanently, i.e. not to include seasonally barren cropland)
  2. Herbaceous (nonwoody, greater than 10 cm tall, including grass, crop, and forage plants. Record height as class 2 or 3, corresponding with height at maturity)
  3. Shrub (any woody plant 10 cm to 2 m tall)
  4. Broadleaf tree (usually deciduous, some evergreen)
  5. Mixed broadleaf and conifer tree
  6. Conifer tree (usually evergreen, some deciduous)

#### B. Height

1. Less than 10 cm (for crown type 1 only)
2. 10-99 cm (low) } (for herbaceous and shrub only)
3. 1-2 m (tall) }
4. 3-5 m (short) }
5. 6-20 m (medium) } (for trees only)
6. More than 20 m (tall) }

#### C. Crown Spacing (coverage)

1. Barren (for crown type 1 only)
2. Sparse, 6-10 crown diameters\* (less than 5 percent coverage)
3. Wide, 3-5 crown diameters (6-25 percent coverage)
4. Open, 1-2 crown diameters (26-90 percent coverage)
5. Closed, crowns contiguous (more than 90 percent cover)

\* If spacing of trees or shrubs is more than 10 crown diameters, the tree or shrub component should be ignored and the vegetation classed as herb or barren (2 or 1), as the case may be.



Table 5

## Vegetation Description Class Combinations (Allowed)

Number Symbols by Crown Type		Height, Crown Coverage
111		Barren
Herb		
222	Shrub	Low, sparse
223	322	Low, wide
224	324	Low, open
225	325	Low, closed
232	332	Tall, sparse
233	333	Tall, wide
234	334	Tall, open
235	335	Tall, closed
Broadleaf Tree		
442	Mixed Tree	Short, sparse
443	543	Short, wide
444	544	Short, open
445	545	Short, closed
452	552	Medium, sparse
453	553	Medium, wide
454	554	Medium, open
455	555	Medium, closed
462	562	Tall, sparse
463	563	Tall, wide
464	564	Tall, open
465	565	Tall, closed
Conifer Tree		
642		Short, sparse
643		Short, wide
644		Short, open
645		Short, closed
652		Medium, sparse
653		Medium, wide
654		Medium, open
655		Medium, closed
662		Tall, sparse
663		Tall, wide
664		Tall, open
665		Tall, closed

Table 6

## Relation of Stand Height to Stem Spacing, Stem Diameter, and Height to Branching

Average Stand Height, m	Stand Height to Stem Spacing and Stem Diameter*	
	Average Stem Spacing m	Average Stem Diameter cm
12-17	2-3.5	10-20
	4-5.5	21-25
17.1-22	4-4.5	22
	5.5	26-30
22.5-25	2.4	15
	4.3	28
26-30	3	25-30
	4.5-5	35-40
	7	
	(1)	(2)
	(2)	(1)
	(1)	(2)

On the basis of the samples used for the above, the average height of branching relates to average stand height approximately by the relation (in metres):

$$\text{Branching height} = \frac{\text{Stand height} - 5}{1.25} \pm 7$$

Note: In closed stands, as these are, an approximate 1:1 correlation obviously exists between stem spacing and crown diameter.  
 \* Stand averages based upon samples of 20 or more trees per stand, 21 stands represented; mostly conifer, all planted, all pruned, all closed canopy).

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Table 7

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UNITED SOIL CLASSIFICATION (Including Identification and Description)										Laboratory Classification Criteria		
Major Division	Group Symbols	Typical Names	Field Identification Procedures (Including Soil Color, Soil Structure, and Soil Consistency)	Information Required for Describing Soils	Use grain-size curve in identifying the fractions as given under field identification.					Laboratory Classification Criteria		
1	2	3	4	5	6	7					8	
Fine-grained Soils More than half of material is smaller than No. 200 sieve size. The No. 200 sieve size is about the smallest particle visible to the naked eye.	Clays	Well-sorted, gravelly, sandy, silty, or clayey	Widespread in gravelly and sandy soils. Amount of all inorganic particles other than clay is small.	For well-sorted soils add information on soil structure, soil color, soil consistency, and drainage characteristics.	Determine percentages of gravel and sand from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size) coarse-grained soils are classified as follows:  Less than 5% fines: Gravelly sand, silty sand, or clayey sand. 5% to 12% fines: Sandy gravel, silty gravel, or clayey gravel. 12% to 20% fines: Gravelly sand, silty sand, or clayey sand. 20% to 35% fines: Sandy gravel, silty gravel, or clayey gravel. 35% to 60% fines: Gravelly sand, silty sand, or clayey sand. 60% to 85% fines: Sandy gravel, silty gravel, or clayey gravel. 85% to 100% fines: Gravelly sand, silty sand, or clayey sand.	No meeting all gradation requirements for SM or PL less than 7					No meeting all gradation requirements for SM or PL less than 7	
		Clayey gravel, gravelly sand, silty sand, or silty clay	Widespread in gravelly and sandy soils. Amount of all inorganic particles other than clay is small.	No meeting all gradation requirements for SM or PL less than 7					No meeting all gradation requirements for SM or PL less than 7			
		Clayey sand, sandy clay, silty clay, or clay	Widespread in gravelly and sandy soils. Amount of all inorganic particles other than clay is small.	No meeting all gradation requirements for SM or PL less than 7					No meeting all gradation requirements for SM or PL less than 7			
		Clayey silt, silty clay, or clay	Widespread in gravelly and sandy soils. Amount of all inorganic particles other than clay is small.	No meeting all gradation requirements for SM or PL less than 7					No meeting all gradation requirements for SM or PL less than 7			
		Clayey silt, silty clay, or clay	Widespread in gravelly and sandy soils. Amount of all inorganic particles other than clay is small.	No meeting all gradation requirements for SM or PL less than 7					No meeting all gradation requirements for SM or PL less than 7			
	Silt and Clays	Well-sorted, gravelly, sandy, silty, or clayey	Widespread in gravelly and sandy soils. Amount of all inorganic particles other than clay is small.	For well-sorted soils add information on soil structure, soil color, soil consistency, and drainage characteristics.	Determine percentages of gravel and sand from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size) coarse-grained soils are classified as follows:  Less than 5% fines: Gravelly sand, silty sand, or clayey sand. 5% to 12% fines: Sandy gravel, silty gravel, or clayey gravel. 12% to 20% fines: Gravelly sand, silty sand, or clayey sand. 20% to 35% fines: Sandy gravel, silty gravel, or clayey gravel. 35% to 60% fines: Gravelly sand, silty sand, or clayey sand. 60% to 85% fines: Sandy gravel, silty gravel, or clayey gravel. 85% to 100% fines: Gravelly sand, silty sand, or clayey sand.	No meeting all gradation requirements for SM or PL less than 7					No meeting all gradation requirements for SM or PL less than 7	
		Clayey gravel, gravelly sand, silty sand, or silty clay	Widespread in gravelly and sandy soils. Amount of all inorganic particles other than clay is small.			No meeting all gradation requirements for SM or PL less than 7					No meeting all gradation requirements for SM or PL less than 7	
		Clayey sand, sandy clay, silty clay, or clay	Widespread in gravelly and sandy soils. Amount of all inorganic particles other than clay is small.			No meeting all gradation requirements for SM or PL less than 7					No meeting all gradation requirements for SM or PL less than 7	
		Clayey silt, silty clay, or clay	Widespread in gravelly and sandy soils. Amount of all inorganic particles other than clay is small.			No meeting all gradation requirements for SM or PL less than 7					No meeting all gradation requirements for SM or PL less than 7	
		Clayey silt, silty clay, or clay	Widespread in gravelly and sandy soils. Amount of all inorganic particles other than clay is small.			No meeting all gradation requirements for SM or PL less than 7					No meeting all gradation requirements for SM or PL less than 7	
Coarse-grained Soils More than half of material is larger than No. 200 sieve size.	Gravels	Well-sorted, gravelly, sandy, silty, or clayey	Widespread in gravelly and sandy soils. Amount of all inorganic particles other than clay is small.	For well-sorted soils add information on soil structure, soil color, soil consistency, and drainage characteristics.	Determine percentages of gravel and sand from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size) coarse-grained soils are classified as follows:  Less than 5% fines: Gravelly sand, silty sand, or clayey sand. 5% to 12% fines: Sandy gravel, silty gravel, or clayey gravel. 12% to 20% fines: Gravelly sand, silty sand, or clayey sand. 20% to 35% fines: Sandy gravel, silty gravel, or clayey gravel. 35% to 60% fines: Gravelly sand, silty sand, or clayey sand. 60% to 85% fines: Sandy gravel, silty gravel, or clayey gravel. 85% to 100% fines: Gravelly sand, silty sand, or clayey sand.	No meeting all gradation requirements for SM or PL less than 7					No meeting all gradation requirements for SM or PL less than 7	
		Clayey gravel, gravelly sand, silty sand, or silty clay	Widespread in gravelly and sandy soils. Amount of all inorganic particles other than clay is small.			No meeting all gradation requirements for SM or PL less than 7					No meeting all gradation requirements for SM or PL less than 7	
		Clayey sand, sandy clay, silty clay, or clay	Widespread in gravelly and sandy soils. Amount of all inorganic particles other than clay is small.			No meeting all gradation requirements for SM or PL less than 7					No meeting all gradation requirements for SM or PL less than 7	
		Clayey silt, silty clay, or clay	Widespread in gravelly and sandy soils. Amount of all inorganic particles other than clay is small.			No meeting all gradation requirements for SM or PL less than 7					No meeting all gradation requirements for SM or PL less than 7	
		Clayey silt, silty clay, or clay	Widespread in gravelly and sandy soils. Amount of all inorganic particles other than clay is small.			No meeting all gradation requirements for SM or PL less than 7					No meeting all gradation requirements for SM or PL less than 7	
	Sands	Well-sorted, gravelly, sandy, silty, or clayey	Widespread in gravelly and sandy soils. Amount of all inorganic particles other than clay is small.	For well-sorted soils add information on soil structure, soil color, soil consistency, and drainage characteristics.	Determine percentages of gravel and sand from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size) coarse-grained soils are classified as follows:  Less than 5% fines: Gravelly sand, silty sand, or clayey sand. 5% to 12% fines: Sandy gravel, silty gravel, or clayey gravel. 12% to 20% fines: Gravelly sand, silty sand, or clayey sand. 20% to 35% fines: Sandy gravel, silty gravel, or clayey gravel. 35% to 60% fines: Gravelly sand, silty sand, or clayey sand. 60% to 85% fines: Sandy gravel, silty gravel, or clayey gravel. 85% to 100% fines: Gravelly sand, silty sand, or clayey sand.	No meeting all gradation requirements for SM or PL less than 7					No meeting all gradation requirements for SM or PL less than 7	
		Clayey gravel, gravelly sand, silty sand, or silty clay	Widespread in gravelly and sandy soils. Amount of all inorganic particles other than clay is small.			No meeting all gradation requirements for SM or PL less than 7					No meeting all gradation requirements for SM or PL less than 7	
		Clayey sand, sandy clay, silty clay, or clay	Widespread in gravelly and sandy soils. Amount of all inorganic particles other than clay is small.			No meeting all gradation requirements for SM or PL less than 7					No meeting all gradation requirements for SM or PL less than 7	
		Clayey silt, silty clay, or clay	Widespread in gravelly and sandy soils. Amount of all inorganic particles other than clay is small.			No meeting all gradation requirements for SM or PL less than 7					No meeting all gradation requirements for SM or PL less than 7	
		Clayey silt, silty clay, or clay	Widespread in gravelly and sandy soils. Amount of all inorganic particles other than clay is small.			No meeting all gradation requirements for SM or PL less than 7					No meeting all gradation requirements for SM or PL less than 7	

Table 8  
Seismic Properties of Soils from a New Study in Progress

Soil Name	$V_p$ ft/sec	$V_s$ ft/sec	$\lambda$ lb/in <sup>2</sup>	$\mu$ lb/in <sup>2</sup>	$\gamma$ lb/ft <sup>3</sup>	$\gamma_{sat}$ lb/ft <sup>3</sup>	$\gamma_{sub}$ lb/ft <sup>3</sup>	$N$ lb/in <sup>2</sup>	$N_{60}$ lb/in <sup>2</sup>	Remarks
1	150	75	1.6	1.5	100	120	1.7	0.5	0.1	Recently cultivated fields; loose, compressible topsoils; organic, saturated clays; overlying; dry sand; moist loam; slightly sandy or gravelly soil
2	150	75	1.6	1.5	100	120	1.7	0.5	0.1	Recently cultivated fields; loose, compressible topsoils; organic, saturated clays; overlying; dry sand; moist loam; slightly sandy or gravelly soil
3	150	75	1.6	1.5	100	120	1.7	0.5	0.1	Recently cultivated fields; loose, compressible topsoils; organic, saturated clays; overlying; dry sand; moist loam; slightly sandy or gravelly soil
4	150	75	1.6	1.5	100	120	1.7	0.5	0.1	Recently cultivated fields; loose, compressible topsoils; organic, saturated clays; overlying; dry sand; moist loam; slightly sandy or gravelly soil
5	150	75	1.6	1.5	100	120	1.7	0.5	0.1	Recently cultivated fields; loose, compressible topsoils; organic, saturated clays; overlying; dry sand; moist loam; slightly sandy or gravelly soil
6	150	75	1.6	1.5	100	120	1.7	0.5	0.1	Recently cultivated fields; loose, compressible topsoils; organic, saturated clays; overlying; dry sand; moist loam; slightly sandy or gravelly soil
7	150	75	1.6	1.5	100	120	1.7	0.5	0.1	Recently cultivated fields; loose, compressible topsoils; organic, saturated clays; overlying; dry sand; moist loam; slightly sandy or gravelly soil
8	150	75	1.6	1.5	100	120	1.7	0.5	0.1	Recently cultivated fields; loose, compressible topsoils; organic, saturated clays; overlying; dry sand; moist loam; slightly sandy or gravelly soil
9	150	75	1.6	1.5	100	120	1.7	0.5	0.1	Recently cultivated fields; loose, compressible topsoils; organic, saturated clays; overlying; dry sand; moist loam; slightly sandy or gravelly soil
10	150	75	1.6	1.5	100	120	1.7	0.5	0.1	Recently cultivated fields; loose, compressible topsoils; organic, saturated clays; overlying; dry sand; moist loam; slightly sandy or gravelly soil
11	150	75	1.6	1.5	100	120	1.7	0.5	0.1	Recently cultivated fields; loose, compressible topsoils; organic, saturated clays; overlying; dry sand; moist loam; slightly sandy or gravelly soil
12	150	75	1.6	1.5	100	120	1.7	0.5	0.1	Recently cultivated fields; loose, compressible topsoils; organic, saturated clays; overlying; dry sand; moist loam; slightly sandy or gravelly soil
13	150	75	1.6	1.5	100	120	1.7	0.5	0.1	Recently cultivated fields; loose, compressible topsoils; organic, saturated clays; overlying; dry sand; moist loam; slightly sandy or gravelly soil
14	150	75	1.6	1.5	100	120	1.7	0.5	0.1	Recently cultivated fields; loose, compressible topsoils; organic, saturated clays; overlying; dry sand; moist loam; slightly sandy or gravelly soil
15	150	75	1.6	1.5	100	120	1.7	0.5	0.1	Recently cultivated fields; loose, compressible topsoils; organic, saturated clays; overlying; dry sand; moist loam; slightly sandy or gravelly soil
16	150	75	1.6	1.5	100	120	1.7	0.5	0.1	Recently cultivated fields; loose, compressible topsoils; organic, saturated clays; overlying; dry sand; moist loam; slightly sandy or gravelly soil
17	150	75	1.6	1.5	100	120	1.7	0.5	0.1	Recently cultivated fields; loose, compressible topsoils; organic, saturated clays; overlying; dry sand; moist loam; slightly sandy or gravelly soil
18	150	75	1.6	1.5	100	120	1.7	0.5	0.1	Recently cultivated fields; loose, compressible topsoils; organic, saturated clays; overlying; dry sand; moist loam; slightly sandy or gravelly soil
19	150	75	1.6	1.5	100	120	1.7	0.5	0.1	Recently cultivated fields; loose, compressible topsoils; organic, saturated clays; overlying; dry sand; moist loam; slightly sandy or gravelly soil
20	150	75	1.6	1.5	100	120	1.7	0.5	0.1	Recently cultivated fields; loose, compressible topsoils; organic, saturated clays; overlying; dry sand; moist loam; slightly sandy or gravelly soil
21	150	75	1.6	1.5	100	120	1.7	0.5	0.1	Recently cultivated fields; loose, compressible topsoils; organic, saturated clays; overlying; dry sand; moist loam; slightly sandy or gravelly soil
22	150	75	1.6	1.5	100	120	1.7	0.5	0.1	Recently cultivated fields; loose, compressible topsoils; organic, saturated clays; overlying; dry sand; moist loam; slightly sandy or gravelly soil

See Table 9 for explanation of symbols. Descriptions 1 and 2 are typical of the first and second soil layers, respectively. (Adapted from report on preparation of seismic signals from vibrations, courtesy of Charles K. Miller, D. B. E. E.)

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Table 9  
Definition of Seismic Factors Listed in Table 8

**Compression Wave Velocity ( $V_p$ ):** Speed of compression wave through a medium. Compression waves have the greatest velocity of any elastic wave in the same medium. The motion of the particles is parallel to the direction of propagation.  $V_p$  is defined mathematically as

$$V_p = \frac{\lambda + 2G}{\rho}$$

where

- $V_p$  = compression wave velocity,  $LT^{-1}$
- $\lambda$  = Lame's constant,  $ML^{-1}T^{-2}$
- $G$  = shear modulus,  $FL^{-2}$
- $\rho$  = mass density,  $GS^{-1}T^{-2}$

**Shear Wave Velocity ( $V_s$ ):** Speed of a shear wave (particle motion of the medium is perpendicular to the direction of propagation) through a medium and is defined mathematically by the equation

$$V_s = \frac{G}{\rho}$$

where

- $V_s$  = shear wave velocity,  $LT^{-1}$

**Layer Thickness ( $H$ ):** Vertical depth (perpendicular to the surface) of soil layers as distinguished by their differing primary wave velocities. The primary wave velocities of these two layers are determined by techniques of refraction seismology. (Note: The above-defined layer often, but not necessarily, corresponds to soil layers as defined by nonseismic parameters, such as grain size and density.)

**Bulk Density ( $\gamma_d$ ):** The weight ( $W$ ) from a soil sample per unit of volume ( $V$ ) of the sample. Symbolically this is

$$\gamma_d = \frac{W}{V} \text{ (g/cm}^3\text{)}$$

**Surface Rigidity Spring Constant ( $k_c$ ):** Spring constant for linear (elastic) approximation of loading spring. The spring constant is derived from load deflection curves and is similar to the coefficient of subgrade reaction,  $k_s$ , in the literature dealing with pavement design.

**Maximum Spring Travel ( $Z_{max}$ ):** The maximum deflection (extrapolated from load-deflection curves) that could occur from a specified load applied to the soil surface.



# Appendix A: Roadside Terrain Descriptions

1. The profile data sheets as described in the text are presented in this appendix. They are assembled in numerical sequence from 1 through 104. The profile data sheets enumerated below are accompanied by one or two (number in parentheses) sheets of on-site photographs with, in most cases, a detailed large-scale cross-sectional profile diagram of the roadbed and immediately adjacent terrain.

14 (2)	28 (1)	58 (1)	90 (1)
15 (2)	32 (1)	59 (2)	91 (2)
16 (1)	33 (2)	60 (1)	
17 (2)	34 (1)	72 (1)	
18 (2)	53 (2)	73 (1)	
19 (1)	54 (1)	74 (2)	
21 (2)	55 (2)	75 (2)	
25 (2)	56 (2)	76 (2)	
26 (1)	57 (1)	77 (1)	

2. Most of the photographs are in stereoscopic pairs and, in general, include a view directly down the road across the ground location of the specified sample site, as defined in the text (see paragraph 10 in the main text), and one or more views to left and right from the road, or across the road, at the sample site. In some cases, additional photographs are included to show other terrain conditions or landscape features of especial interest. In general, an attempt has been made to orient the photographs and detail profile diagrams with the general topographic profile as shown on the profile data sheet. The photographer, however, was not aware of the convention that was subsequently adopted for defining road direction (see paragraph 24 in the main text), and there are therefore cases where none of the photographs are correctly oriented with the profile as shown on the data sheet.

3. In all cases, a photograph orientation sketch is included with the photographs. On this sketch, arrows originate at the location from which each photograph was taken and point in the direction of view, and circled numbers identify the respective photographs. There is no scale implied on these orientation sketches. For a few of the sites that were inspected in the field, the photographs were defective. The roadbed

detail sketches for sites 29 and 31 are shown without the photographs. In addition, a few undesignated sites were photographed as a matter of interest. Some of these are presented as supplemental photographs at the end of the appendix, numbered from 200 through 216.

4. The cross-section diagrams are drawn to approximate scale (0.1, 0.2, or 0.4 in. = 1 m), so far as the measurements provided by the field observer would permit, and the measured values are also shown on the diagram. When measurements are not specified, the values were not recorded by the field observer; the missing values have been estimated by the present editor, and the profiles drawn with the estimated values at scale. For very small measurements (25 or less) the profiles have been drawn with a bias toward exaggeration rather than generalization.

Sample Number: 1

Date: 28 Aug 74

Map Number: 24918

Scale: 1:50000

Coordinate Location:

Geographic: 51°09'26"N UTM Ref.:  
08°55'00"E

Landscape: Forested upland

Road: Class: 5

Direction: E

Site Type: 2

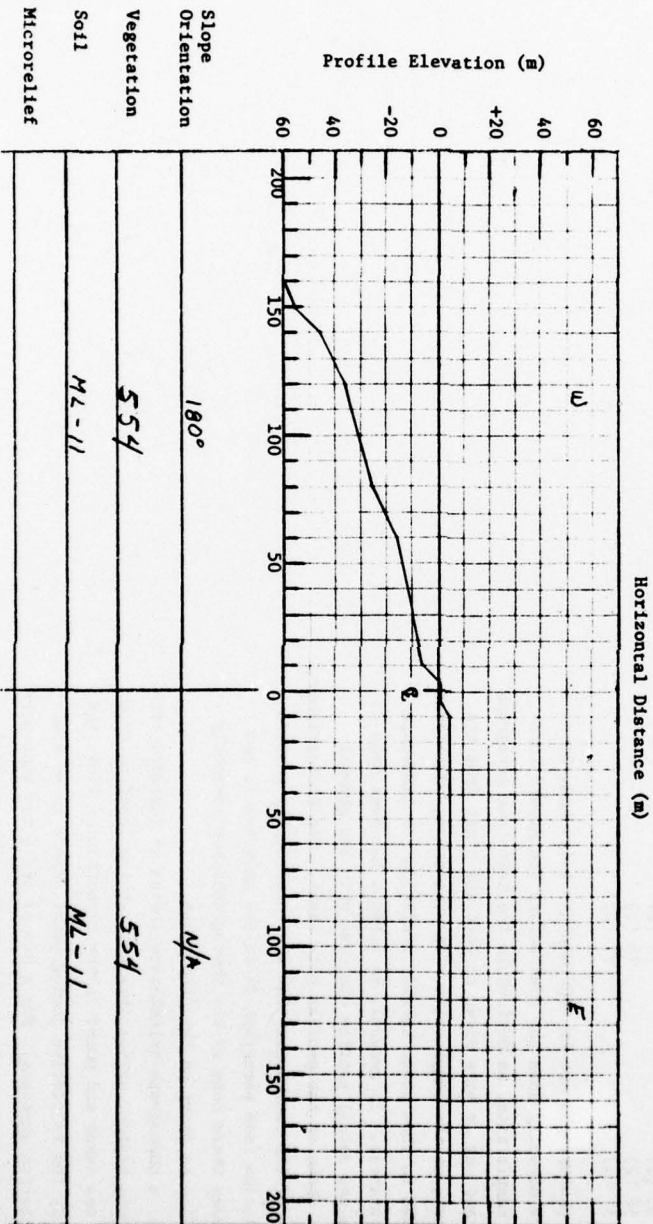
Notes and Comments:



Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



SITE 1 - PROFILE DATA

A2

Sample Number: 2

Date: 28 Aug 74

Map Number: 24918

Scale: 1:50000

Coordinate Location:

Geographic:

UTM Ref.:  
51°12'21"N  
08°55'00"E

Landscape: Forested upland

Road: Class: 4

Direction: E

Site Type: 2

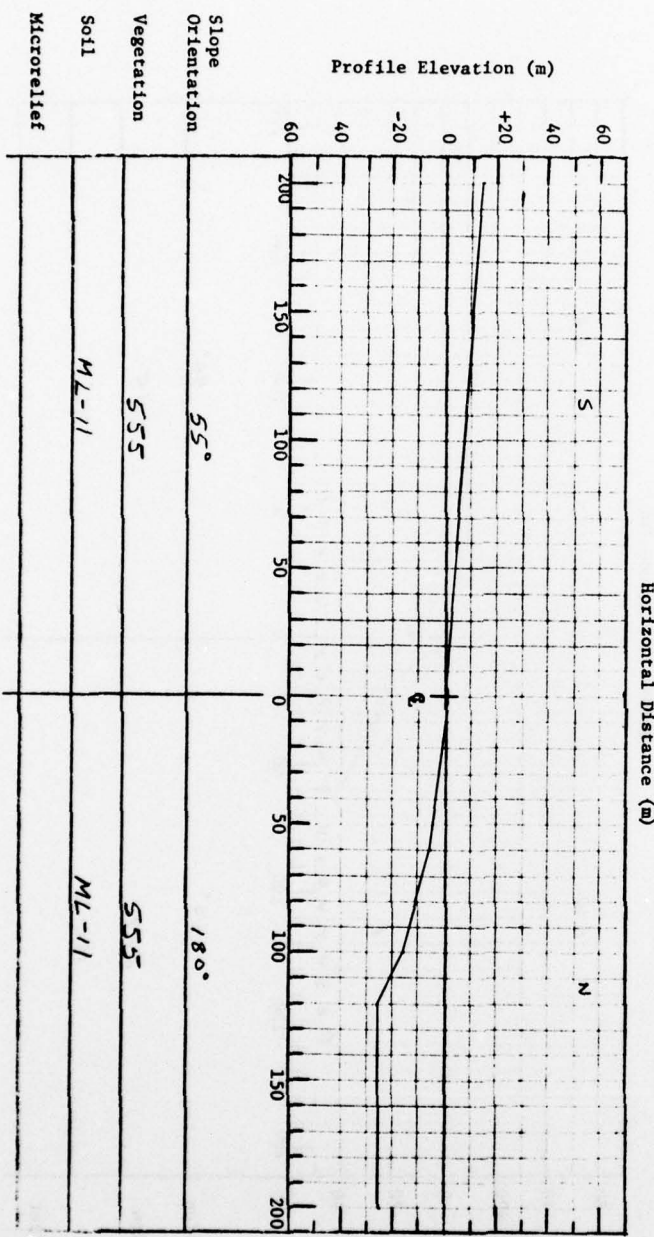
Notes and Comments:



Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



SITE 2 - PROFILE DATA

A3





Sample Number: 4

Date: 29 Aug 74

Notes and Comments:

Map Number: L 4920

Scale: 1:50000

Coordinate Location:

Geographic: 51°09'08"N UTM Ref.:

Landscape: Cultivated hill slope

09°15'12"E

Road: Class: 5

Direction: NW

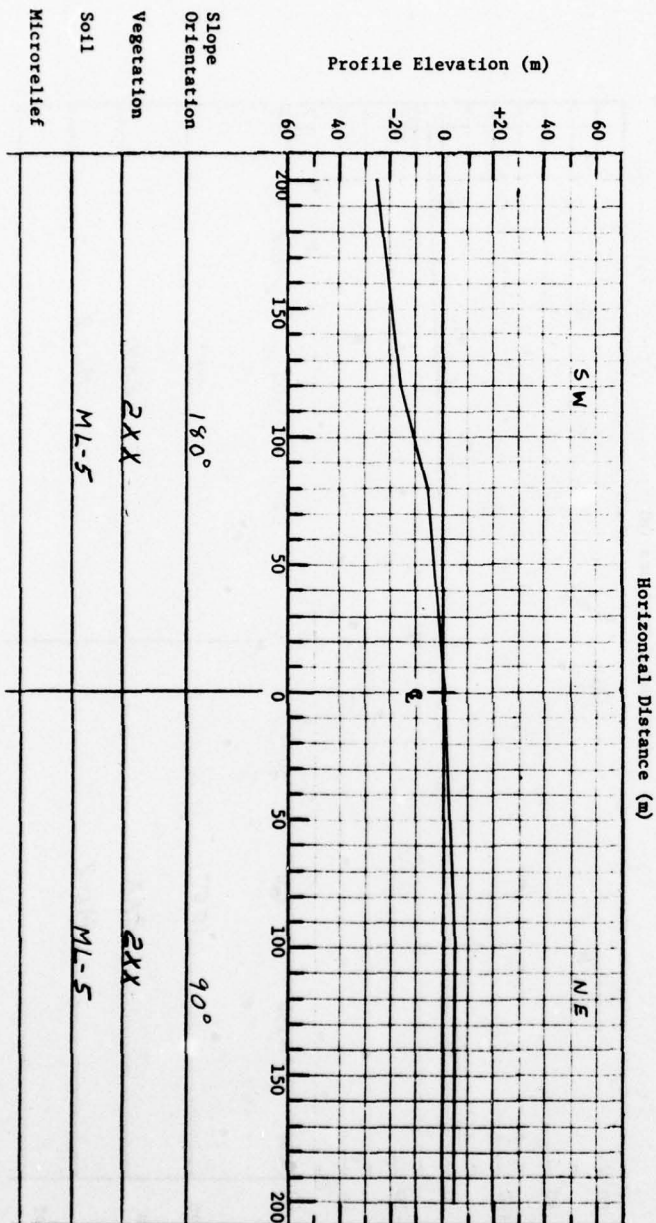
Site Type: 2



Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



SITE 4 - PROFILE DATA

A5

Sample Number: 5

Date: 29 Aug 74

Map Number: L 4920

Scale: 1:50000

Coordinate location:

Geographic: 51°10'04"N UTM Ref.:

Landscape: Cultivated gently sloping

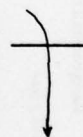
09°16'58"E

Road: Class: 3

Direction: E

Site Type: 4

Notes and Comments:

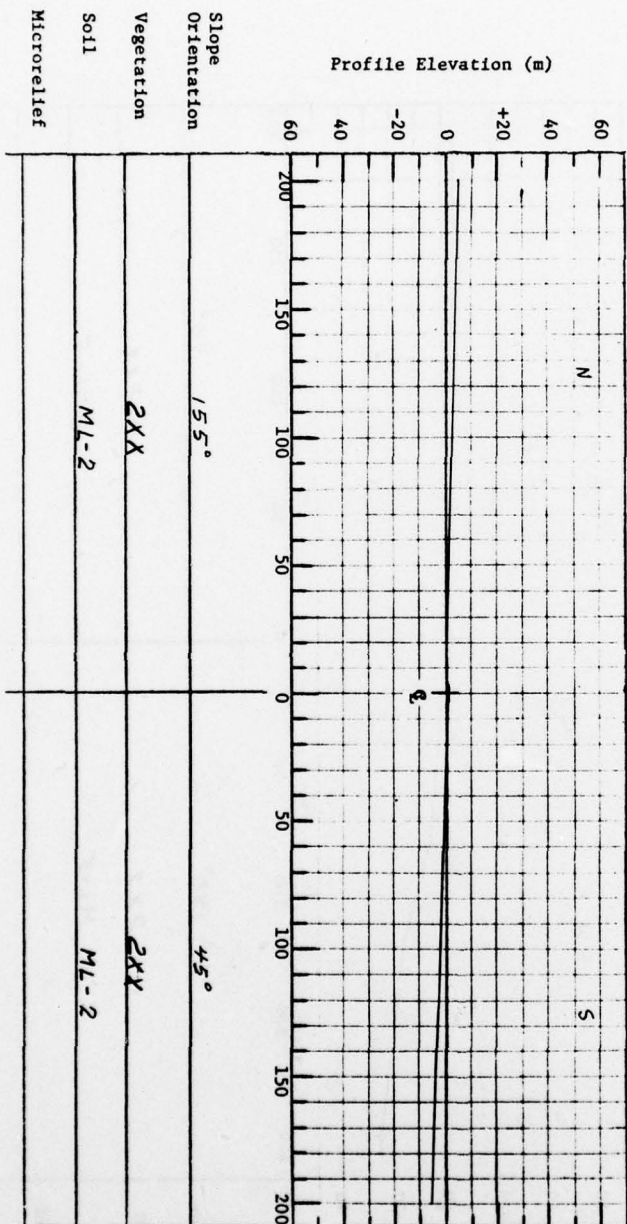


Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.

Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Horizontal Distance (m)



SITE 5 - PROFILE DATA

A6



Sample Number: C

Date: 29 Aug 74

Notes and Comments:

Map Number: L 4920

Scale: 1:50000

Coordinate Location:

Geographic: 51°11'19"N UTM Ref.:

Landscape: Cultivated lowland

09°18'54"E

Road: Class: 2

Direction: NE

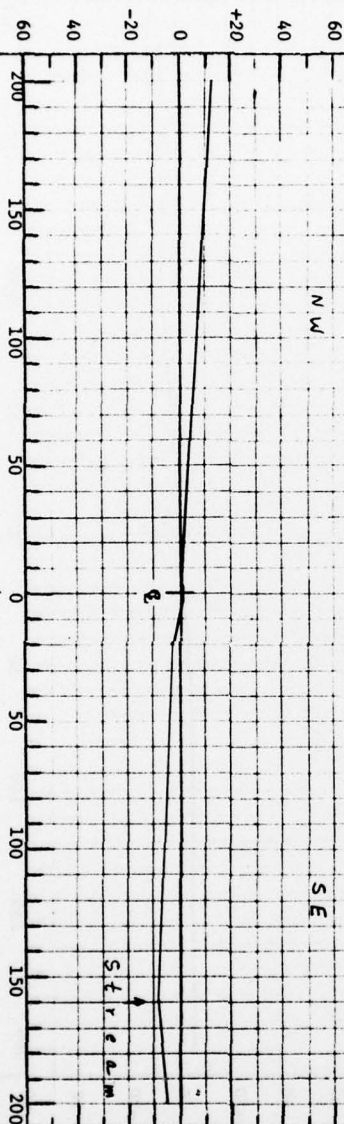
Site Type: 4

Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick. (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.

Profile Elevation (m)



Horizontal Distance (m)

Slope  
Orientation  
Vegetation  
Soil  
Microrelief

45°	2XX	ML-2
180°	2XX	ML-2

SITE 6 - PROFILE DATA

A7

Sample Number: 7

Date: 29 Aug 74

Map Number: L 4922

Scale: 1:50000

Coordinate Location:

Geographic: 51°09'00" N UTM Ref.:

Landscape: Cultivated hillsides

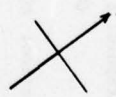
09°35'54" E

Road: Class: 5

Direction: NW

Site Type: 4

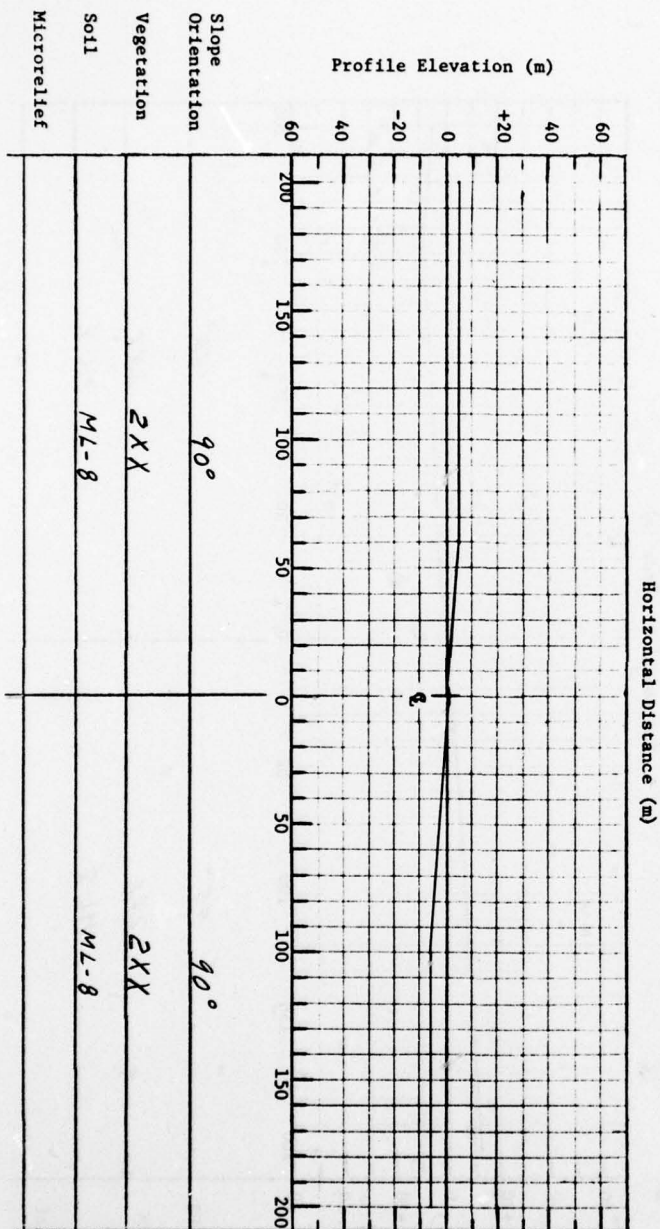
Notes and Comments:



Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



SITE 7 - PROFILE DATA

A8





Sample Number: 9

Date: 30 Aug 74

Map Number: L4422

Scale: 1:50000

Coordinate Location:

Geographic: 51°09'00"N UTM Ref.:  
09°38'57"E

Landscape: Forested upland

Road: Class: 4

Direction: NE

Site Type: 4

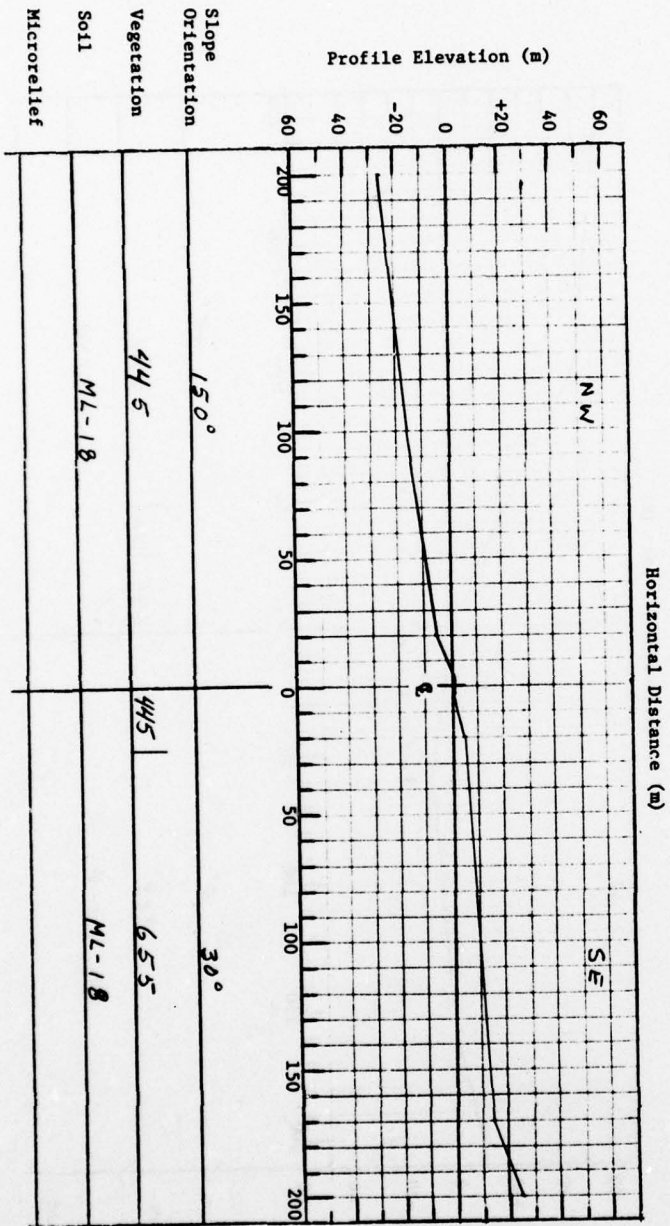
Notes and Comments:

*Handwritten mark resembling a stylized 'S' or '5'.*

Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



SITE 9 - PROFILE DATA

A10

Sample Number: 10

Date: 30 Aug 74

Map Number: L 5116

Scale: 1:50000

Coordinate Location:

Geographic: 50°56'14"N UTM Ref.:

Landscape: Forested & cultivated valley 08°34'51"E

Road: Class: 4

Direction: E

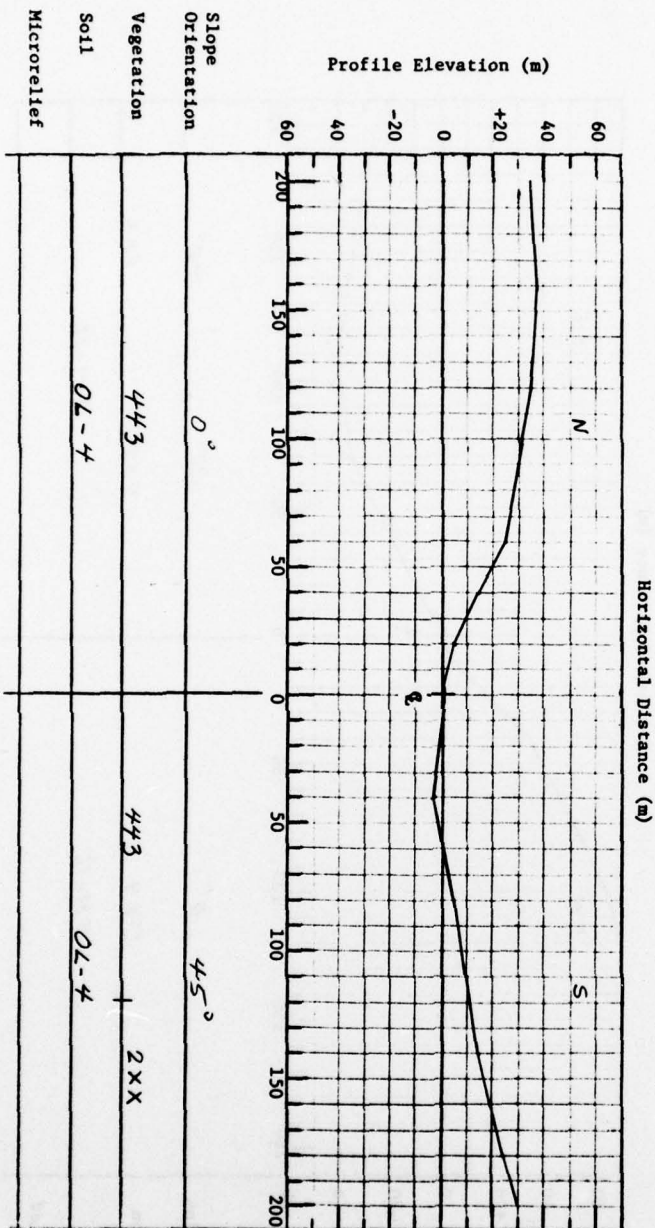
Site Type: 3

Notes and Comments:



Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.

Construction:				Shoulder	
Width (m)	Traffic Surface			Width (m)	Material
	Surface	Material	Thick (cm)		
	Base	Subbase			



SITE 10 - PROFILE DATA

ALL

Sample Number: 11

Date: 30 Aug 74

Map Number: L5116

Scale: 1:50000

Coordinate Location:

Geographic: 50°56'43"N UTM Ref.:  
08°35'00"E

Landscape: Forested valley

Road: Class: 5

Direction: NE

Site Type: 5/3

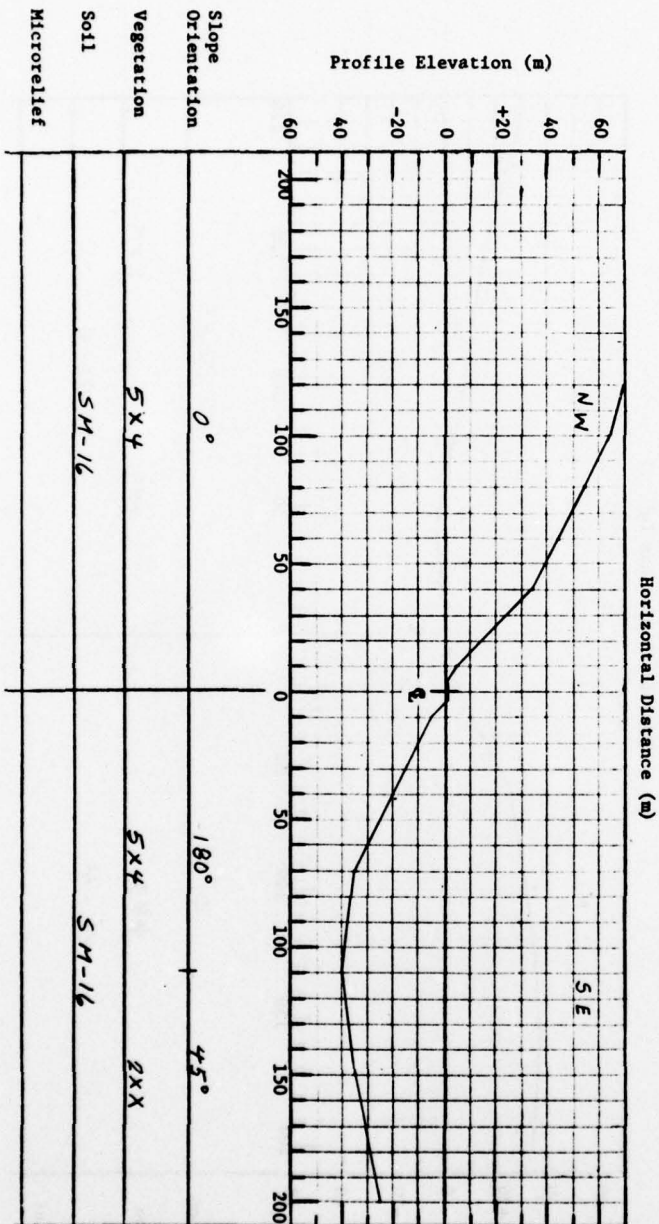
Notes and Comments:

X

Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



SITE 11 - PROFILE DATA

AL2



Sample Number: 12

Date:

Map Number: L 5116

Scale: 1:50000

Coordinate Location:

Geographic: 50°56'14"N UTM Ref.:

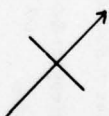
Landscape: Cultivated & forested valley 08°34'51"E

Road: Class: 2

Direction: NW

Site Type: 3

Notes and Comments:



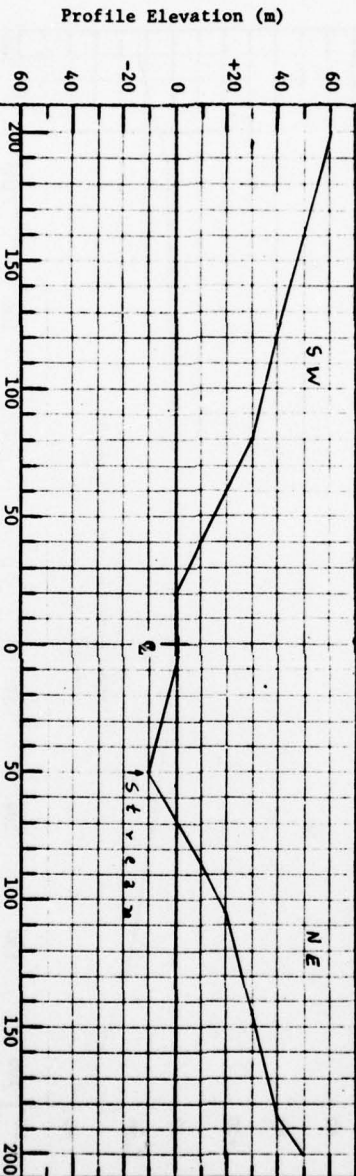
Instruction: On transect profile sketch show

location of important features,  
such as stream crossings, ditches,  
etc.

Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Horizontal Distance (m)



Slope  
Orientation

0°

0°

Vegetation

2 X X

2 X X

443

Soil

OL-4

OL-17

Microrelief

SITE 12 - PROFILE DATA

AL3

Sample Number: 13

Date: 30 Aug 74

Map Number: 25118

Scale: 1:50000

Coordinate Location:

Geographic: 50°57'12"N UTM Ref.:

Landscape: Forested + cultivated upland 08°55'20"E

Road: Class: 5

Direction: E

Site Type: 2

Notes and Comments:

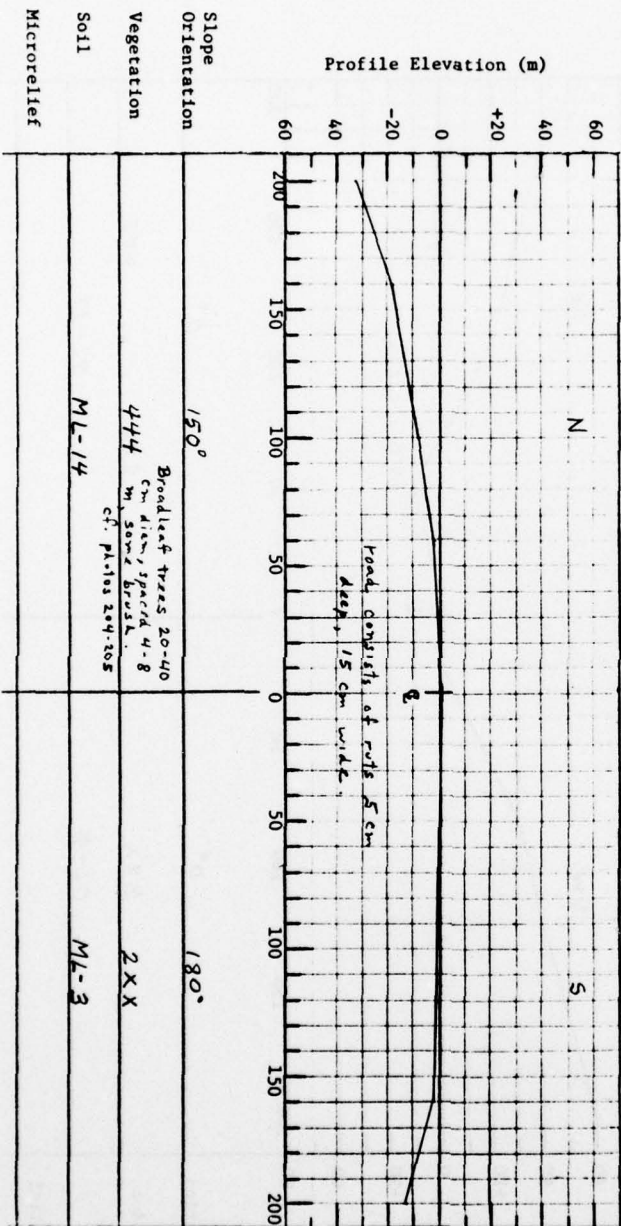


Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base	*			
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.

\* DIRT farm road with cobbles less than 10 cm diam. Horizontal Distance (m)



SITE 13 - PROFILE DATA

ALH

Sample Number: 14

Date: 30 Aug 74

Map Number: L5118

Scale: 1:50,000

Coordinate Location:

Geographic: 50°57'34"N UTM Ref.:

Landscape: Cultivated w/ly

08°56'13"E

Road: Class: 3

Direction: NW

Site Type: 3/2

Notes and Comments:

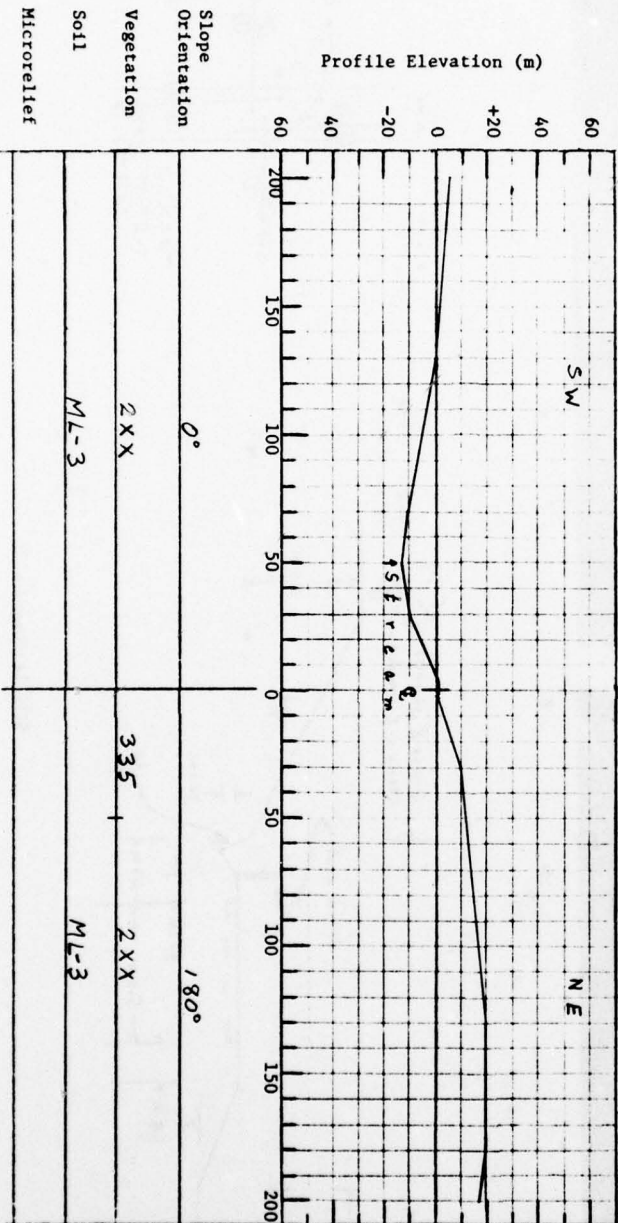


Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
* 5.5	Base	Blacktop			
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.

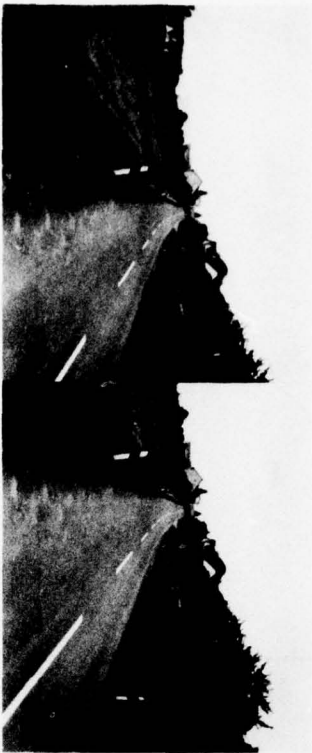
Horizontal Distance (m) \* from field observation, Aug 1974



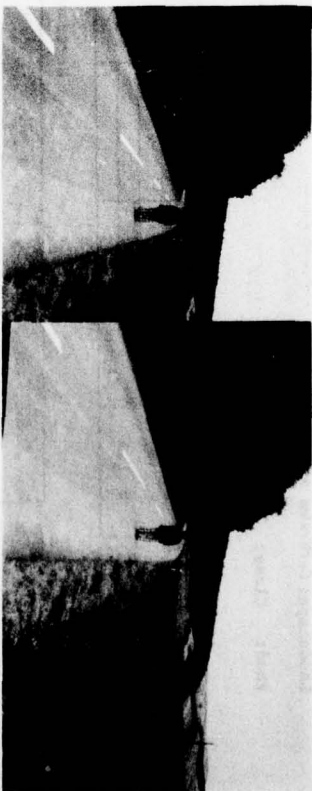
SITE 14 - PROFILE DATA

A15





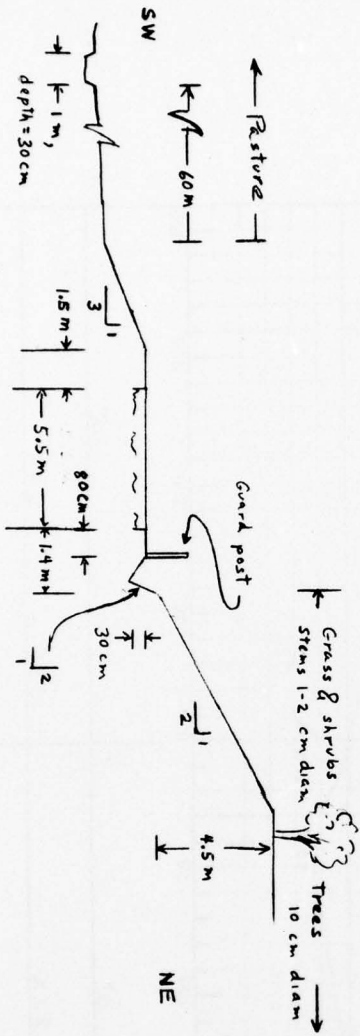
11



12

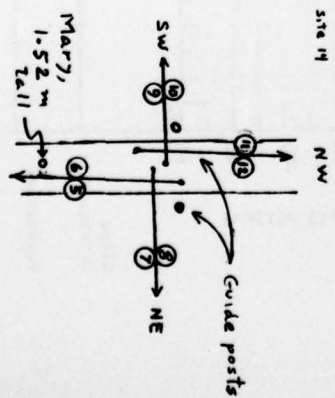
5

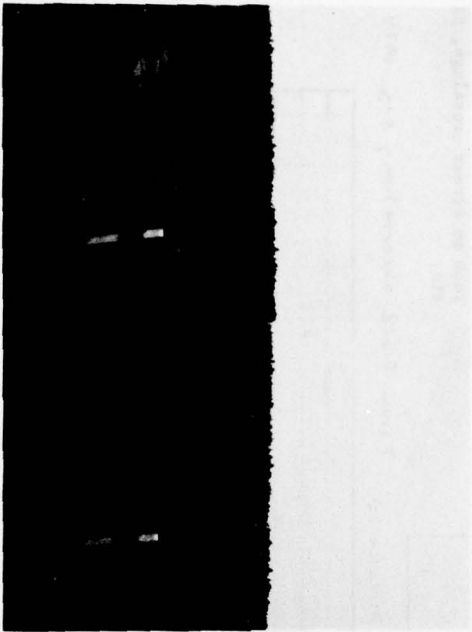
6



SITE 14 (Sheet 1 of 2)

AL6

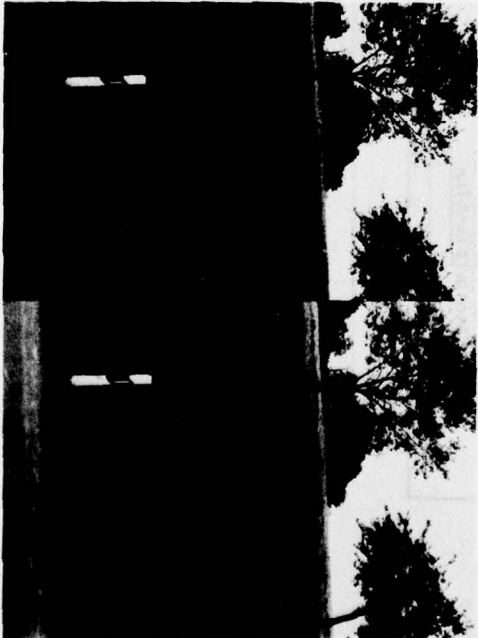




9

10

SITE 14 (Sheet 2 of 2)



8

7

Sample Number: 15

Date: 30 Aug 74

Notes and Comments:

Map Number: 45118

Scale: 1:50000

Coordinate Location:

Geographic: 50°58'S 6°08'E UTM Ref.:

Landscape: Pasture & cultivated fields

Road: Class: 2

Direction: N

Site Type: 1

Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
* 8	Base	Black Top			
	Subbase				

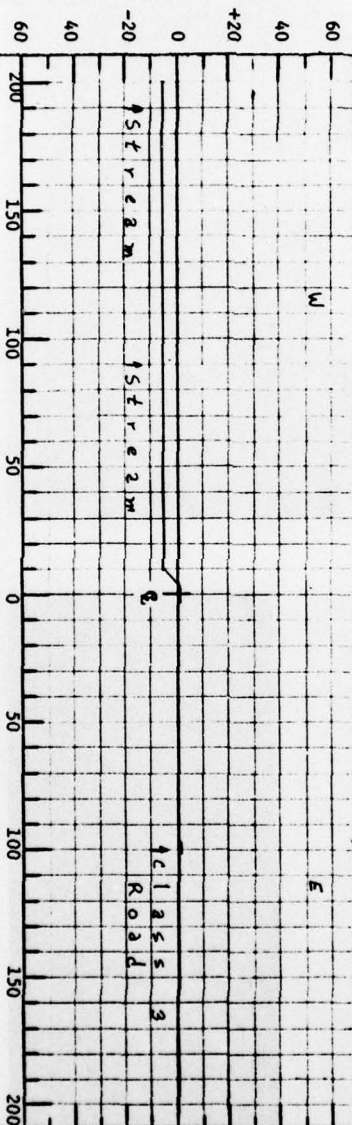
Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



Horizontal Distance (m)

\* from field observation, Aug. 1974

Profile Elevation (m)



Slope  
Orientation  
Vegetation  
Soil  
Microrelief

180°	2 x x	335	443	443	2 x x
0°	ML-6				ML-6

SITE 15 - PROFILE DATA

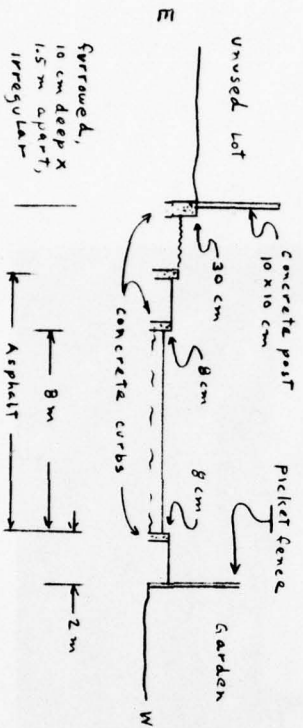
A18



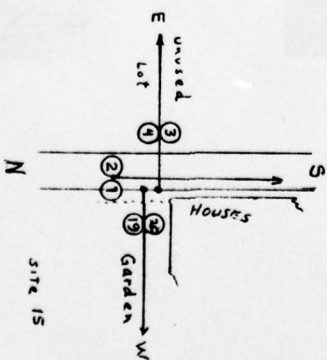


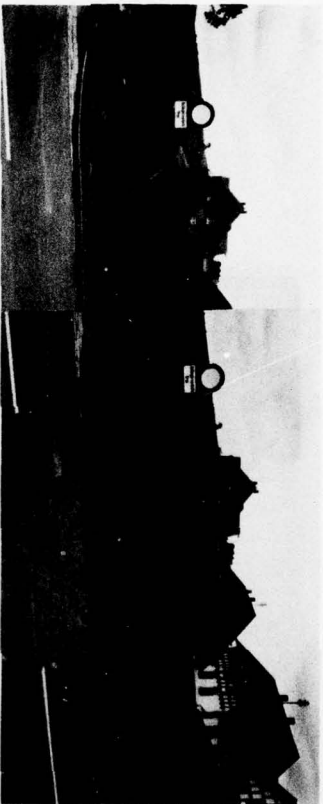
2

1



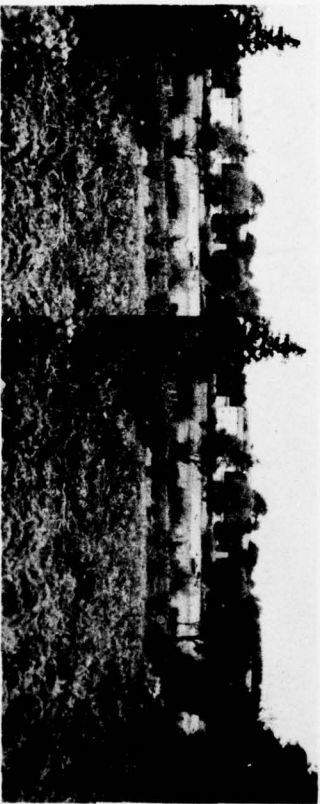
SITE 15 (Sheet 1 of 2)





4

3



20

19

SITE 15 (Sheet 2 of 2)

A20

Sample Number: 16

Date: 30 Aug 74

Map Number: 25118

Scale: 1:50000

Coordinate Location:

Geographic: 50°59'52"N UTM Ref.:

Landscape: Forested hillside

08°59'51"E

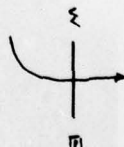
Road:

Class: 25

Direction: N

Site Type: 4

Notes and Comments:



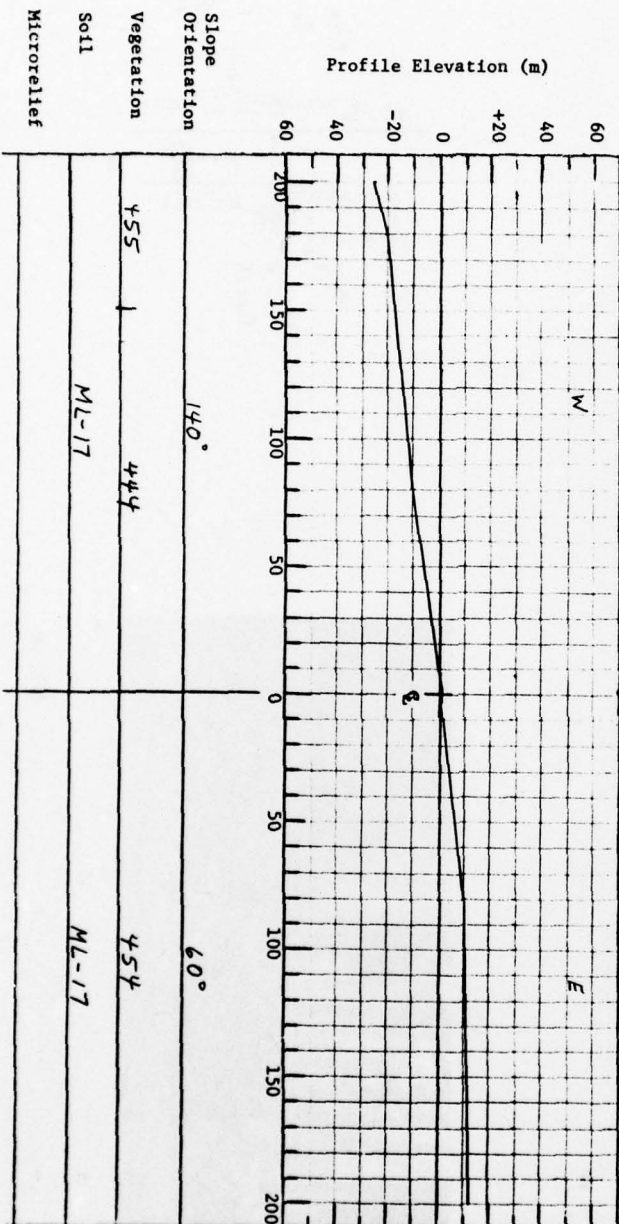
Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface *	Material	Thick. (cm)	Width (m)	Material
* 4	Base	metalled	light		
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.

Horizontal Distance (m)

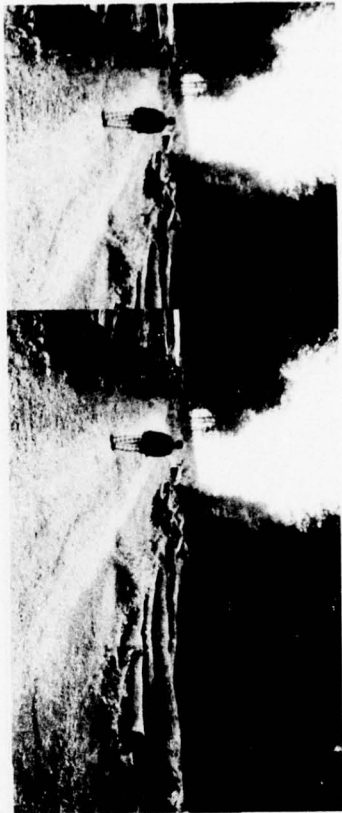
\* from field observation, Aug 1974



SITE 16 - PROFILE DATA

A21





18

17

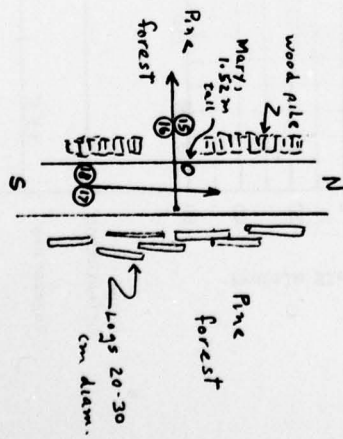
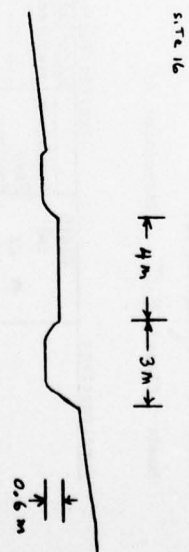


16

15

SITE 16

A22



Sample Number: 17

Date: 3 Sept 74

Map Number: 45120

Scale: 1:50000

Coordinate Location:

Geographic: 50°57'00"N UTM Ref.:

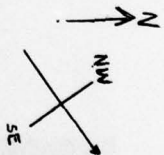
Landscape: Wooded + cultivated openland 09°15'40"E

Road: Class: 4

Direction: NE

Site Type: 1

Notes and Comments:

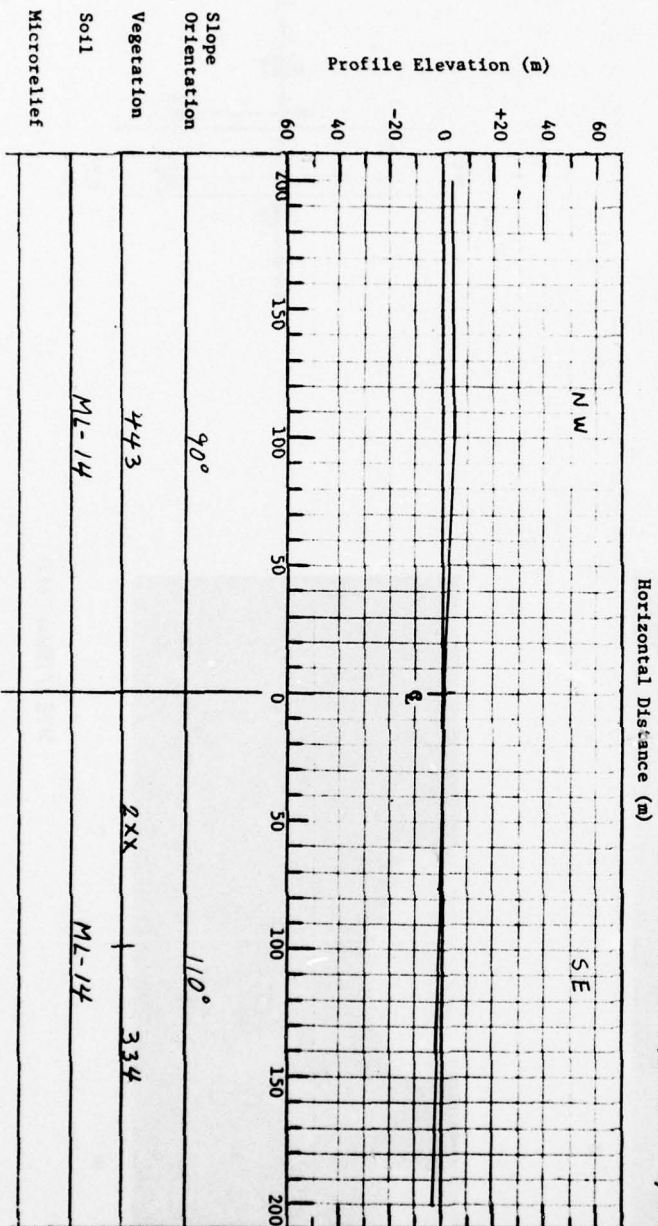


Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.

\* From field observation, Aug 1974.

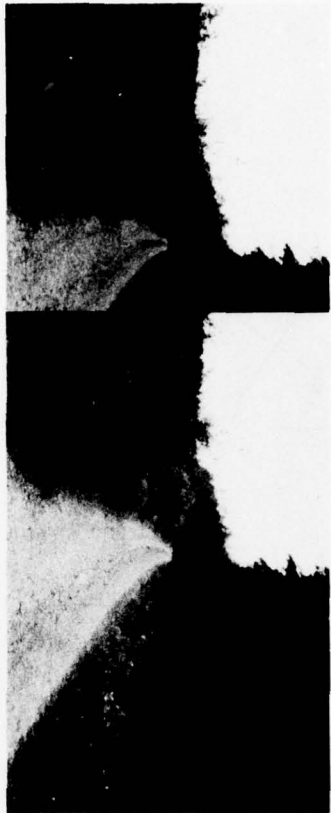
Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
* 5	Base	Material			
	Subbase				



SITE 17 - PROFILE DATA

A23



8

7

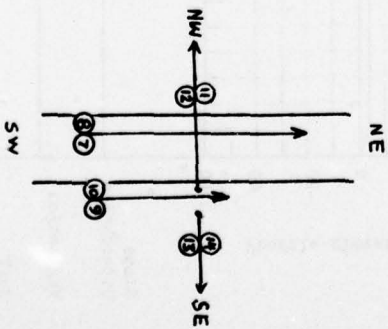
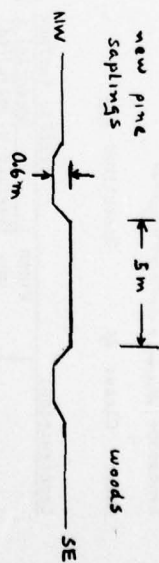


10

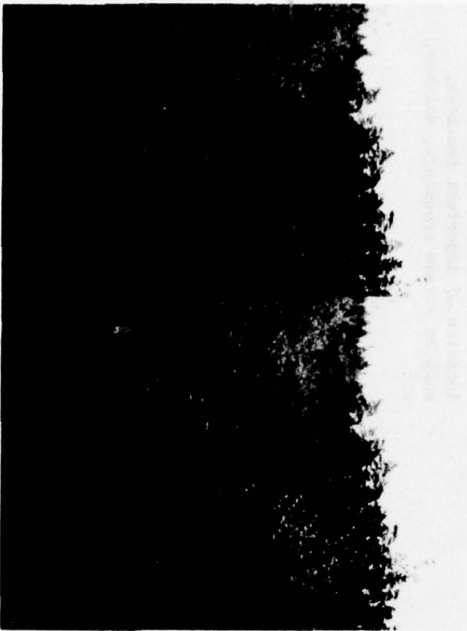
9

SITE 17 (Sheet 1 of 2)

A24

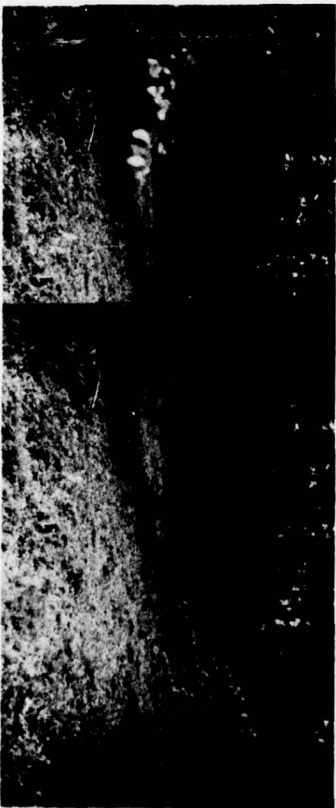






12

11



14

13

SITE 17 (Sheet 2 of 2)

A25

Sample Number: 18

Date: 3 Sept 74

Notes and Comments:

Map Number: L5120

Scale: 1:50000

Coordinate Location:

Geographic: 50°57'00"N UTM Ref.:

Landscape: Forested hills, some  
cultivation

09°16'25"E

Road: Class: 5

Direction: NW

Site Type: 4

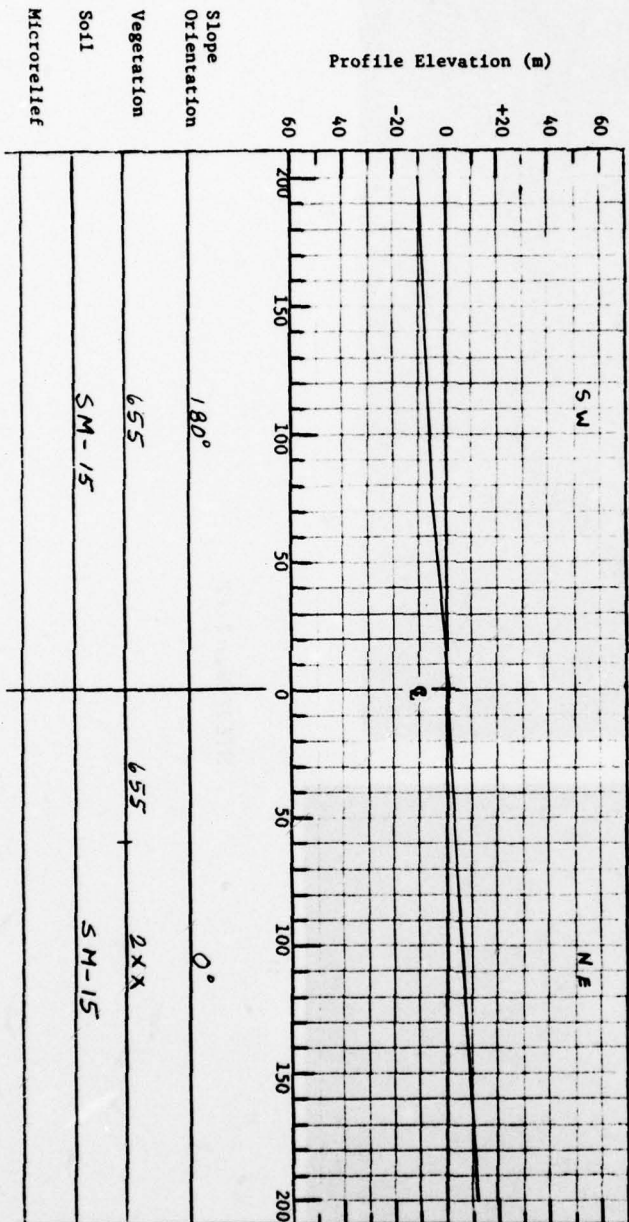


Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
* 4	Base	Gravel	15		
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.

Horizontal Distance (m) \* from field observation, Aug 1974

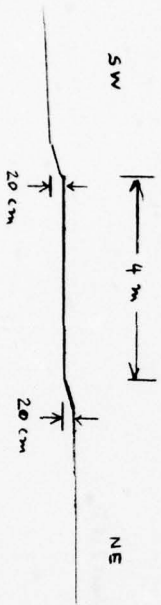


SITE 18 - PROFILE DATA



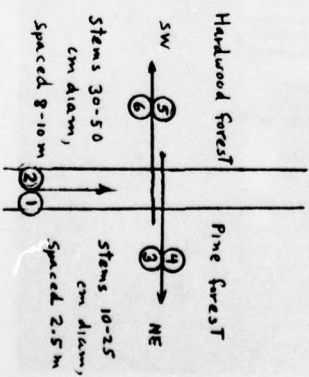
2

1



SITE 18 (Sheet 1 of 2)

A27



Hardwood forest

Pine forest

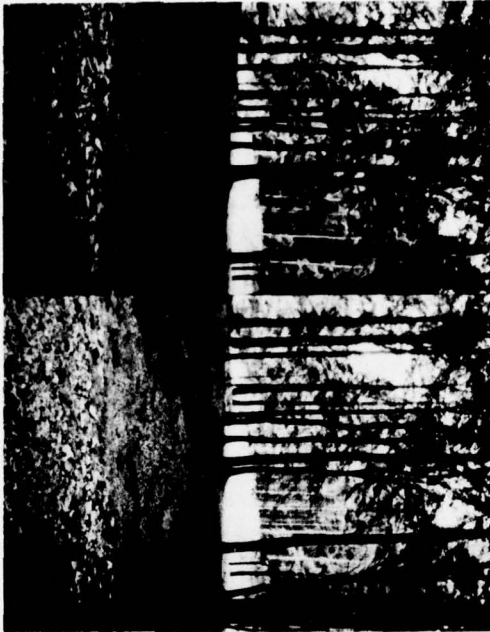
SW  
⑤  
⑥

Stems 30-50  
cm diam,  
Spaced 8-10 m

NE  
③  
④

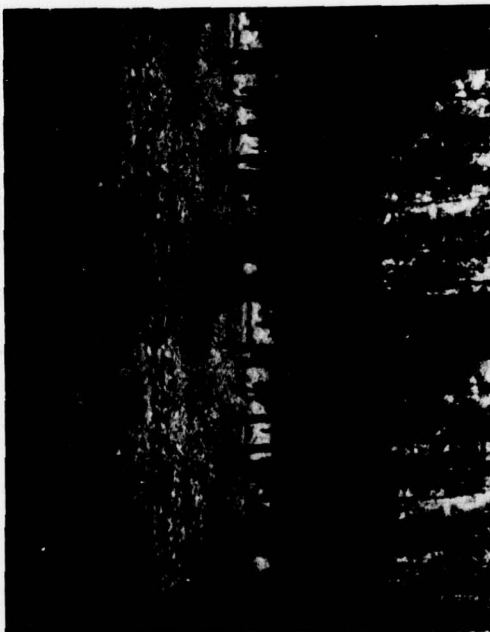
Stems 10-25  
cm diam,  
Spaced 2.5 m





6

5



4

3

SITE 18 (Sheet 2 of 2)

Sample Number: 19

Date: 3 Sept 74

Map Number: L5120

Scale: 1:50000

Coordinate Location:

Geographic: 50°57'00"N UTM Ref.:

Landscape: Cultivated or wooded

09°17'42"E

Road: Class: 2

Direction: NE

Site Type: 1

Notes and Comments:



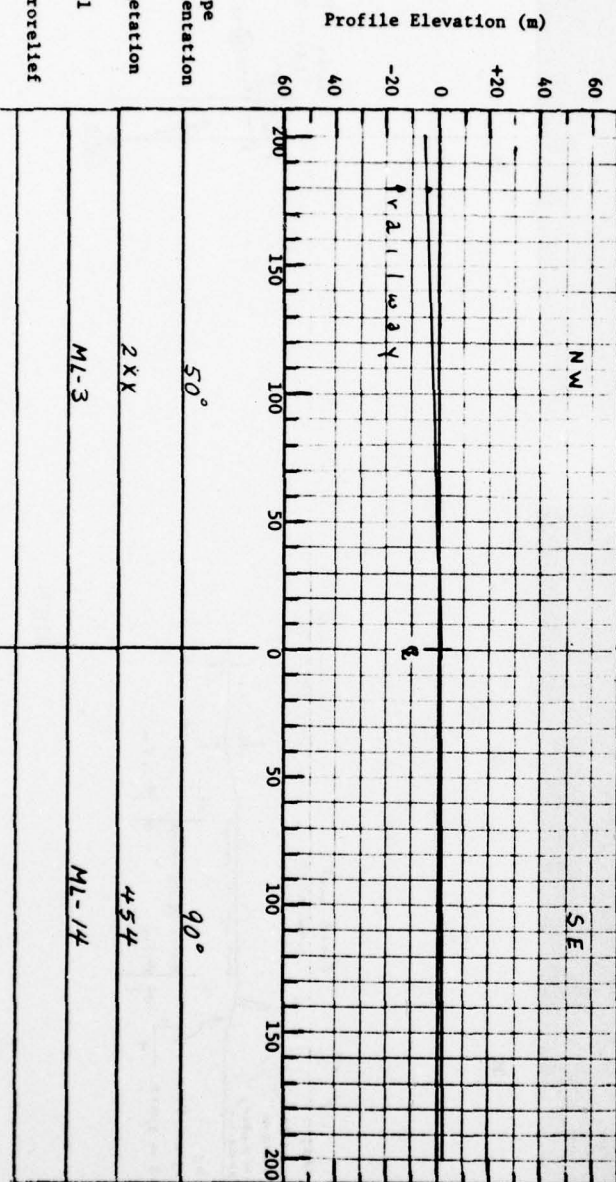
Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	* Blacktop	Thick (cm)	Width (m)	Material
* 12	Base				
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.

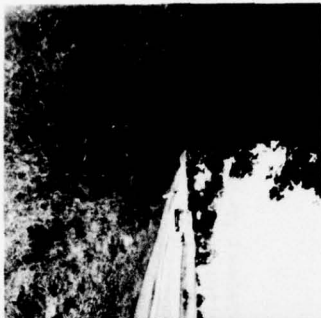
Horizontal Distance (m)

\* field observation, Aug 1974



SITE 19 - PROFILE DATA

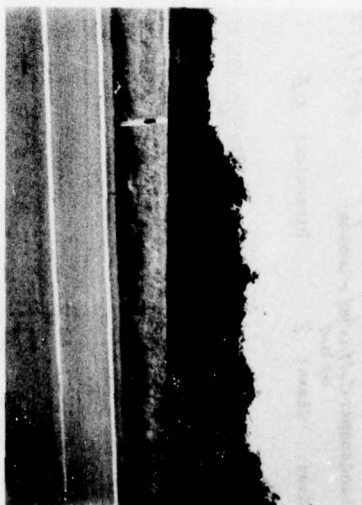
A29



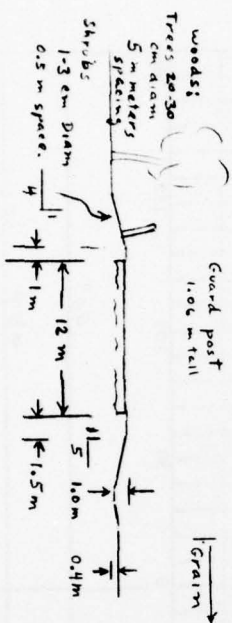
34



35

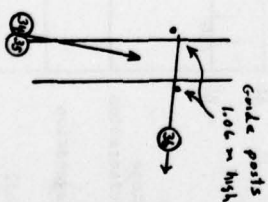


36



SITE 19

A30





Sample Number: 20

Date: 3 Sept 74

Map Number: 5023

Scale: 1:25000

Coordinate Location:

Geographic: 50°57'03"N UTM Ref.:  
09°35'07"E

Landscape: Forested hill

Road: Class: 5

Direction: NE

Site Type: 2

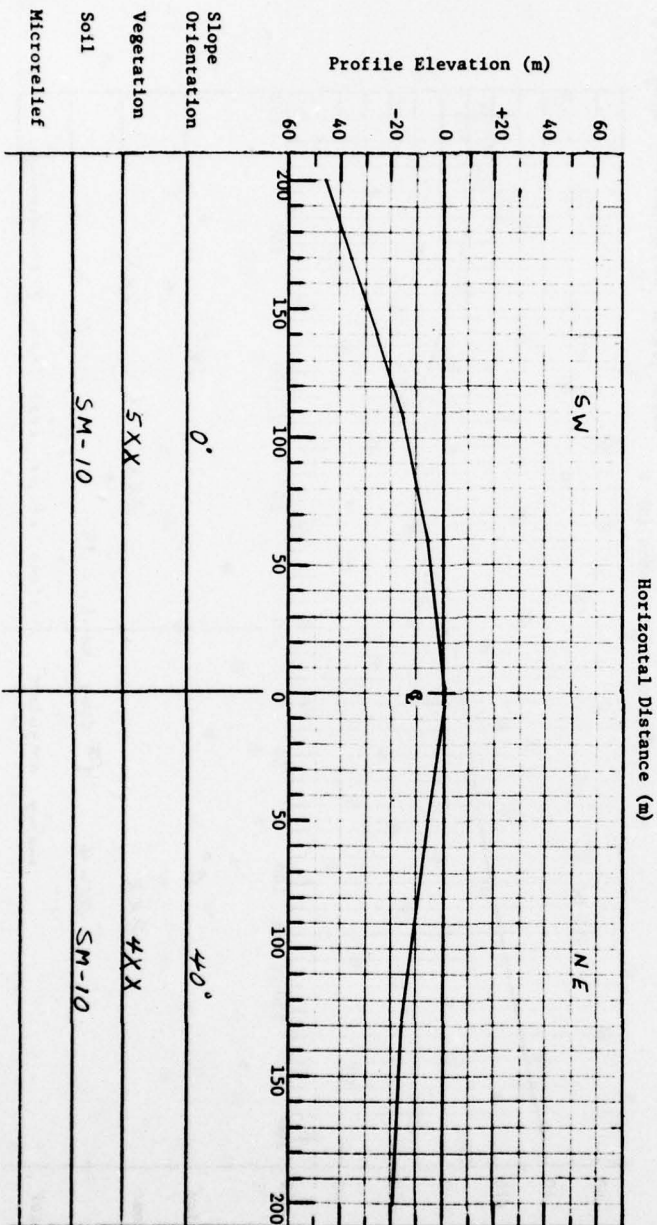
Notes and Comments:



Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



SITE 20 - PROFILE DATA

A31

Sample Number: 21

Date: 3 Sept 74

Map Number: 5023

Scale: 1:25000

Coordinate Location:

Geographic: 50°58'19"N UTM Ref.:

Landscape: *Cylindrical + wooden stream valley + stand pin*

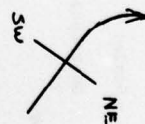
09°37'17"E

Road: Class: 2

Direction: NE

Site Type: 3

Notes and Comments:

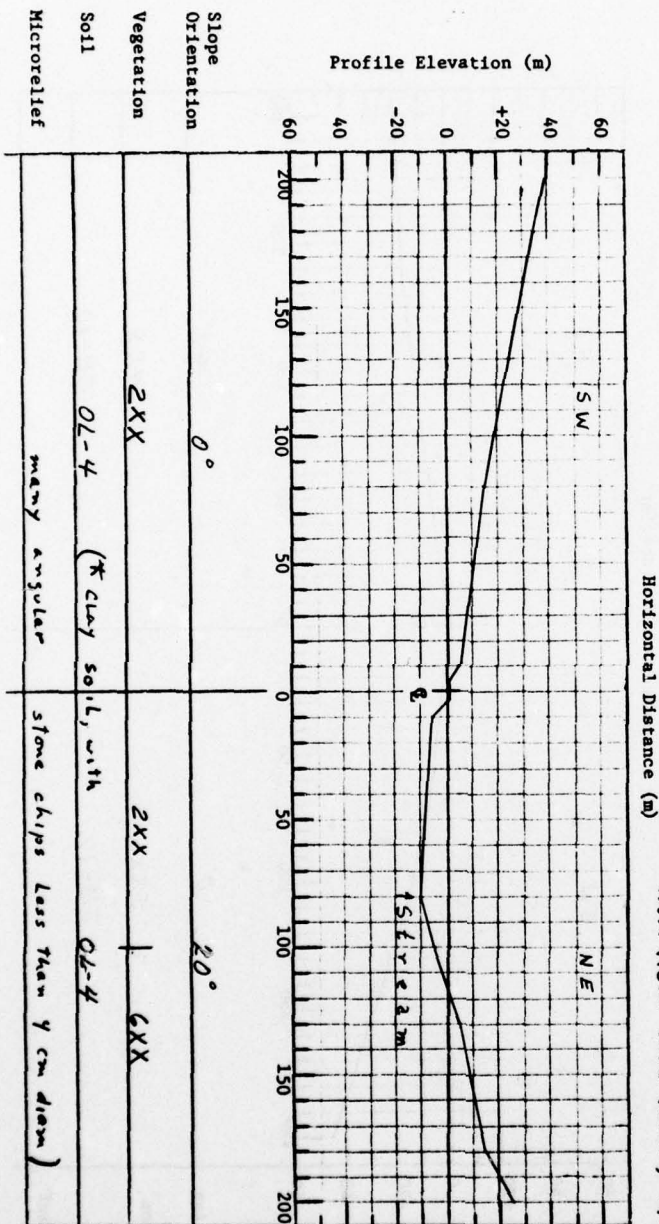


Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface *	Material	Thick (cm)	Width (m)	Material
4.8	Base	Blacktop			
	Subbase				

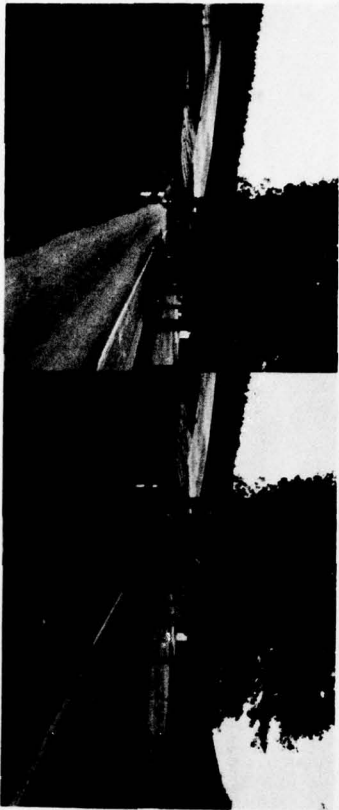
Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.

\* from field observation, Aug 1974



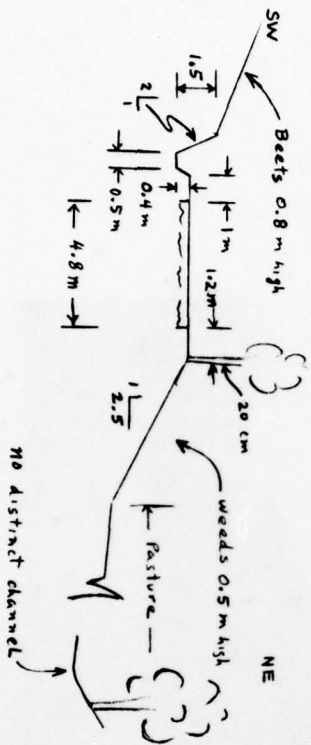
SITE 21 - PROFILE DATA

A32

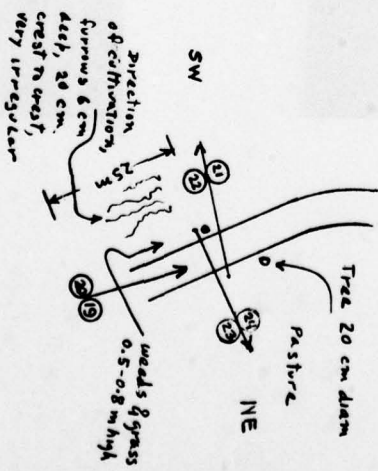


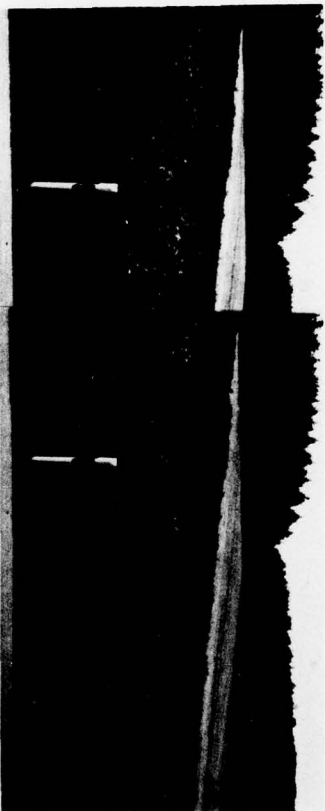
20

19



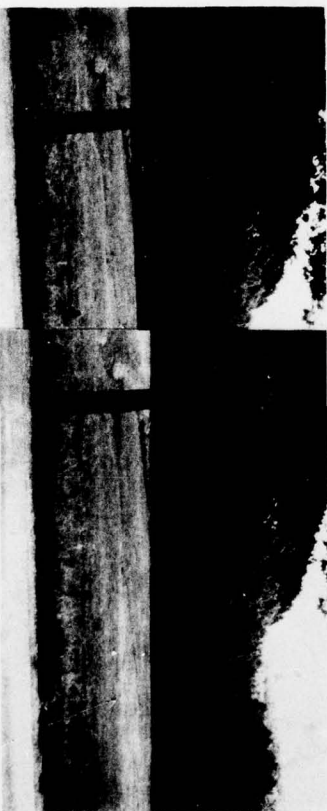
SITE 21 (Sheet 1 of 2)





22

21



24

23

SITE 21 (Sheet 2 of 2)

A314



Sample Number: 22

Date: 3 Sept 74

Notes and Comments:

Map Number: 5023

Scale: 1:25000

Coordinate Location:

Geographic: 5059'05"N UTM Ref.:

Landscape: Forested hills

09°38'28"E

Road: Class: 4

Direction: NE

Site Type: 3

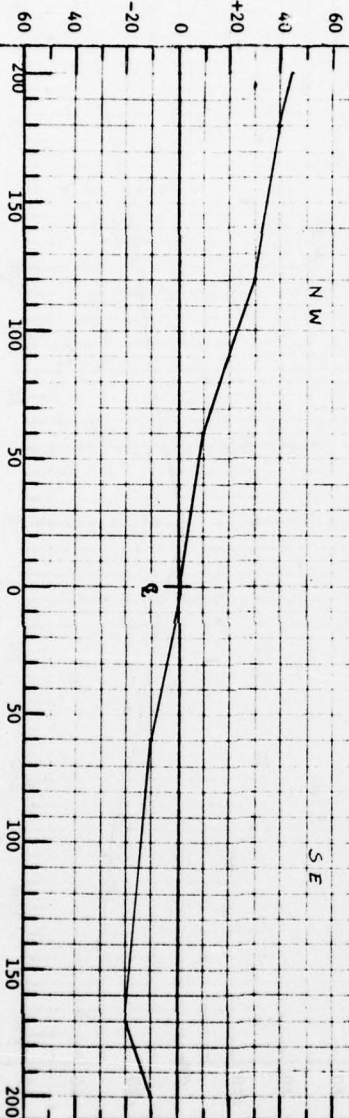
Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction:

On transect profile sketch show location of important features, such as stream crossings, ditches, etc.

Profile Elevation (m)



Horizontal Distance (m)

Slope  
Orientation

0°

150°

Vegetation

5XX

5XX

Soil

ML-14

ML-14

Microrelief

SITE 22 - PROFILE DATA

A35

Sample Number: 23

Date: 3 Sept 74

Map Number: 5025

Scale: 1:25000

Coordinate Location:

Geographic: 50°57'29"N UTM Ref.:

Landscape: Forested hills

09°55'48"E

Road: Class: 5

Direction: NW

Site Type: 2

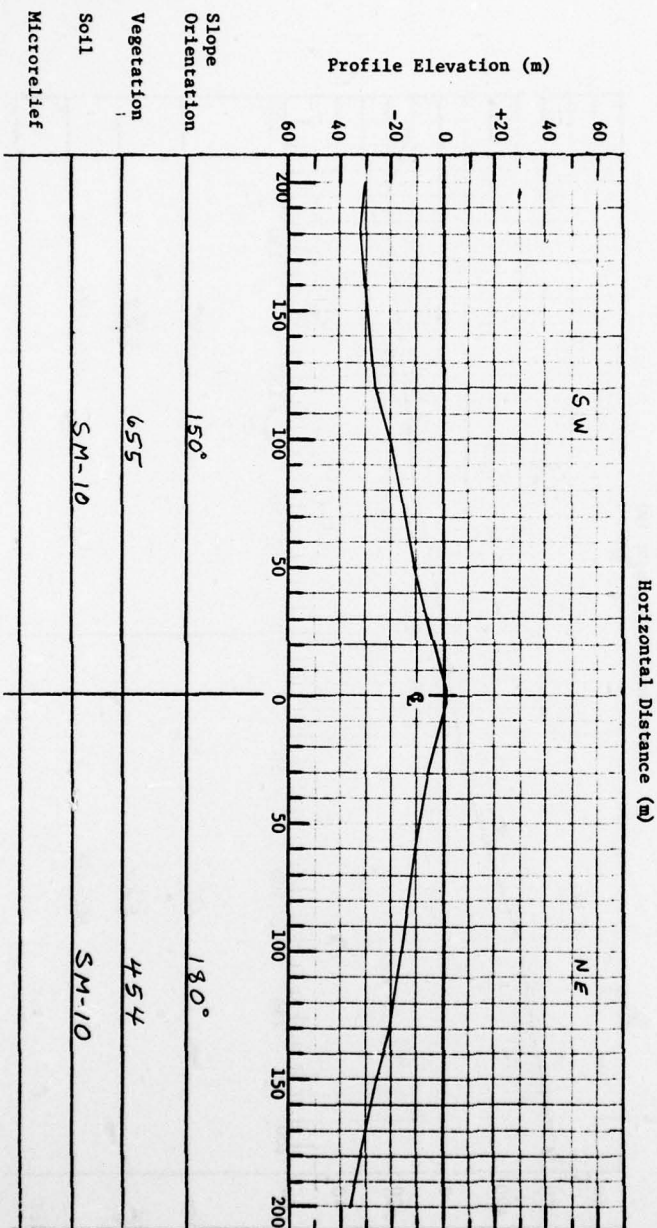
Notes and Comments:



Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



SITE 23 - PROFILE DATA

Sample Number: 24

Date: 3 Sept 74

Map Number: 5025

Scale: 1:25000

Coordinate Location:

Geographic: 50°58'13"N UTM Ref.:

Landscape: Forested valley

09°57'02"E

Road: Class: 4

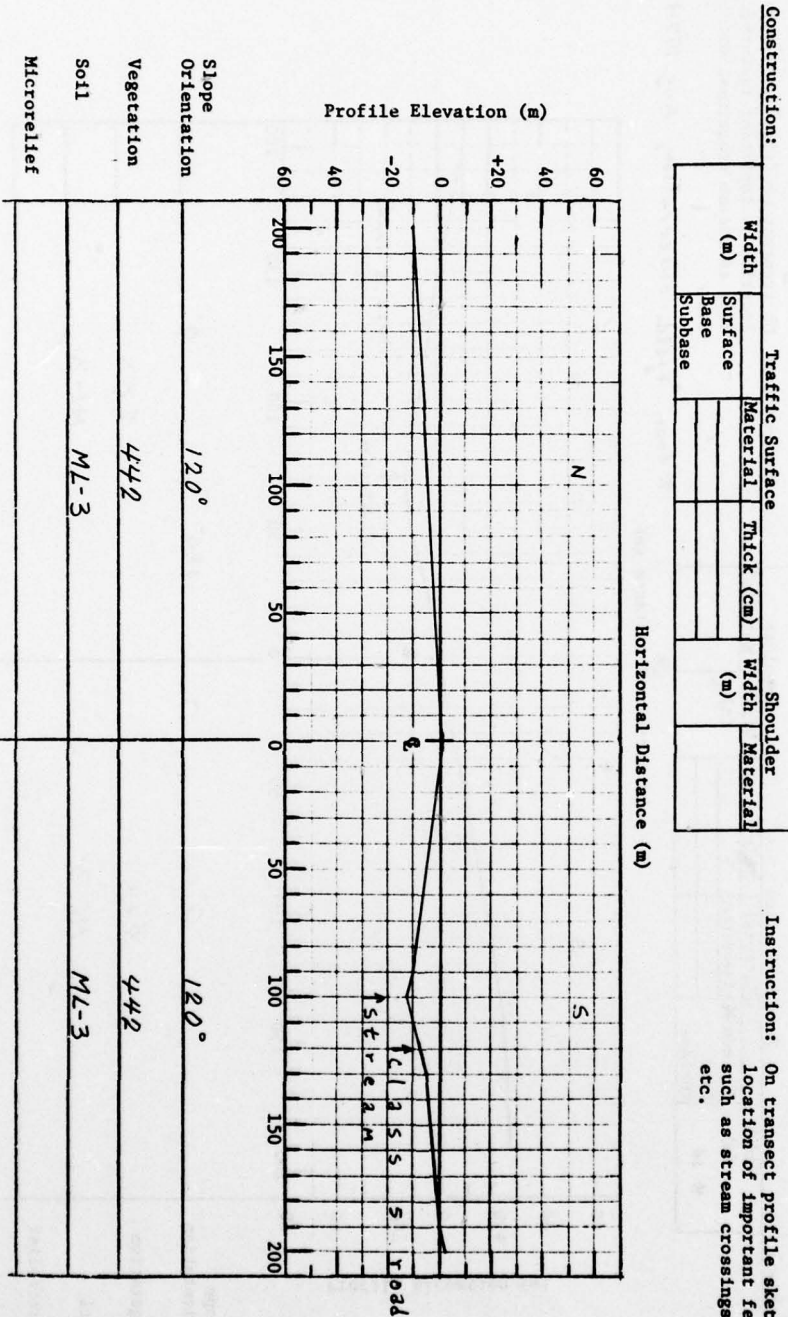
Direction: E

Site Type: 2/3

Notes and Comments:



Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



SITE 24 - PROFILE DATA

A37

Sample Number: 25

Date: 3 Sept 74

Map Number: 5025

Scale: 1:25000

Coordinate Location:

Geographic: 50°59'15"N UTM Ref.:

Landscape: Cultivated valley

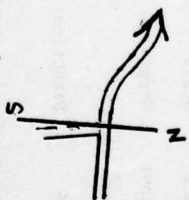
09°58'45"E

Road: Class: 2

Direction: NW

Site Type: 3

Notes and Comments:



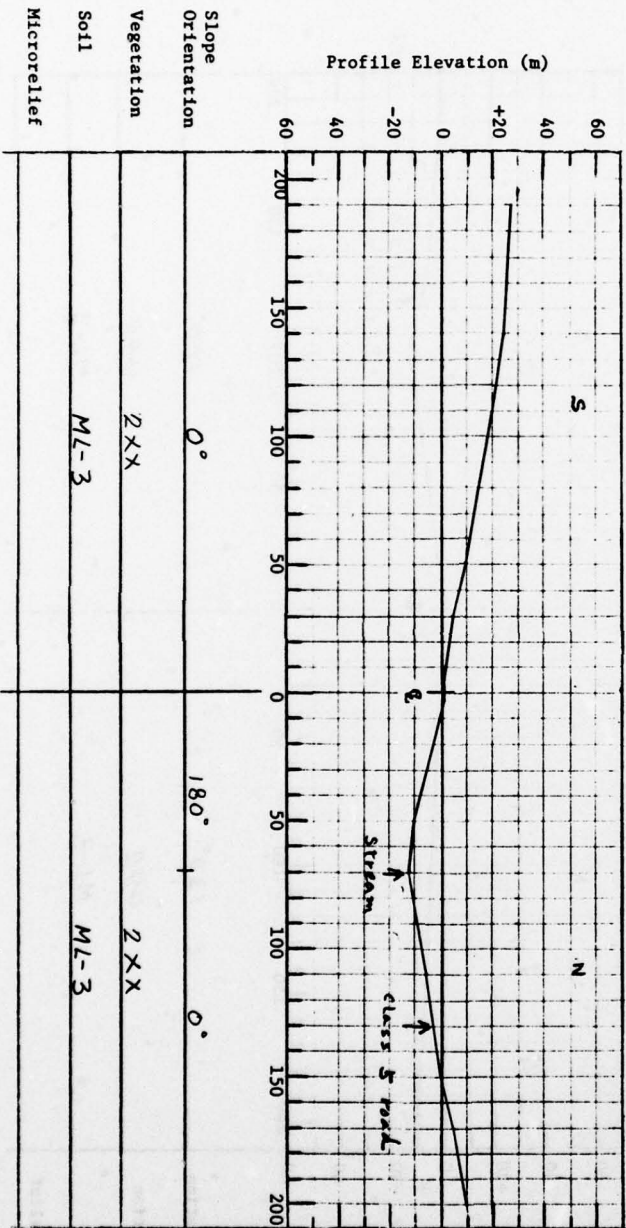
Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.

\* from field observation, Aug 1974

Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface *	Material	Thick (cm)	Width (m)	Material
* 10	Base	Black top			
	Subbase				

Horizontal Distance (m)



SITE 25 - PROFILE DATA

A38



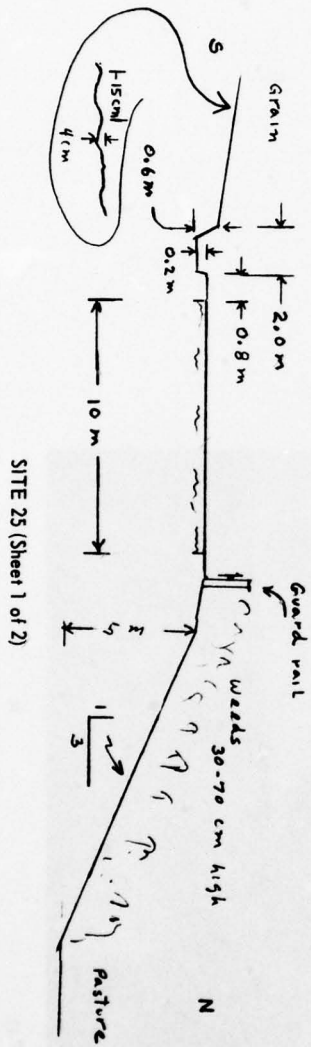


11

12



17



SITE 25 (Sheet 1 of 2)



Sample Number: 26

Date: 3 Sept 74

Map Number: L 5314

Scale: 1:50000

Coordinate Location: Geographic: 50°45'23"N UTM Ref.: 08°15'00"E

Landscape: Cultivated floodplain

Road: Class: 4

Direction: NW

Site Type: 3

Notes and Comments:

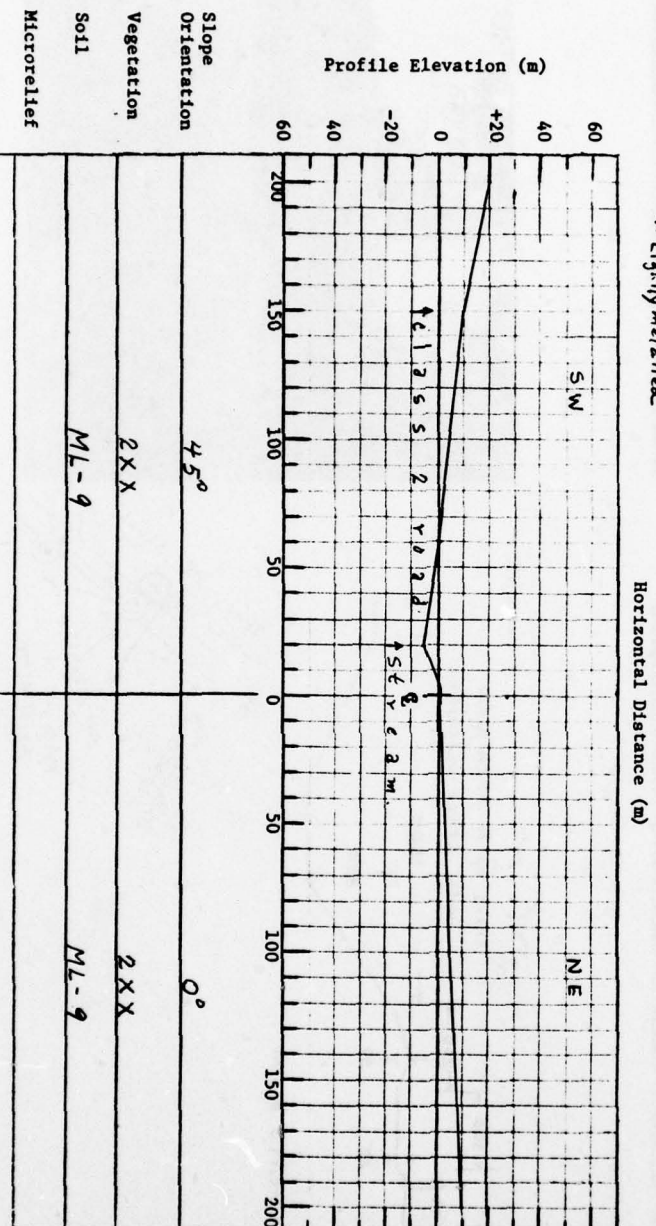


Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
3	Base	dirf, *			
	Subbase				

\* Lightly metalled

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



SITE 26 - PROFILE DATA

A4.1

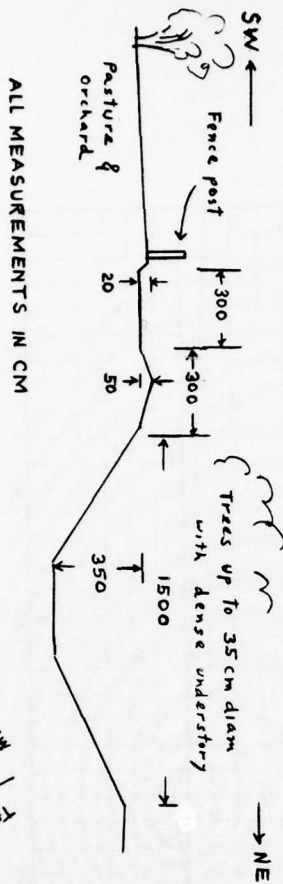


6

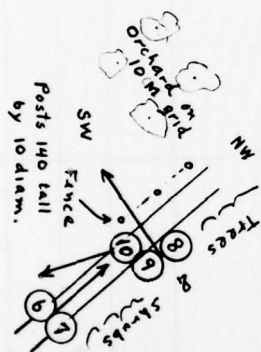
7



10



ALL MEASUREMENTS IN CM



SITE 26  
Alt 2



9

8



Sample Number: 27

Date: 3 Sept 74

Map Number:

Scale: 1:50000

Coordinate location:

Geographic: 50°47'22"N UTM Ref.:

Landscape: Saltub-covered hillside 08°15'00"E

Road: Class: 5

Direction: NW

Site Type: 2

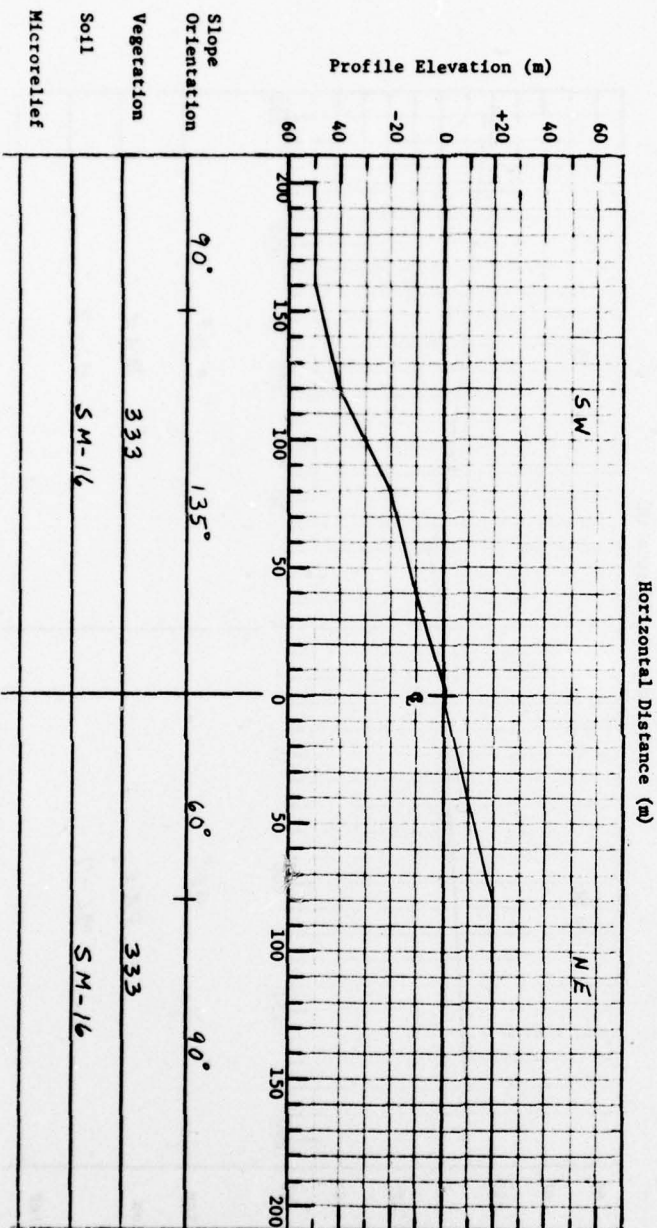
Notes and Comments:



Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



SITE 27 - PROFILE DATA

A43

Sample Number: 28

Date: 3 Sept 74

Map Number: L5314

Scale: 1:50000

Coordinate Location:

Geographic: 50°45'38"N UTM Ref.:

Landscape: *Cultivated valley*

08°36'05"E

Road: Class: 4

Direction: NE

Site Type: 3

Notes and Comments:

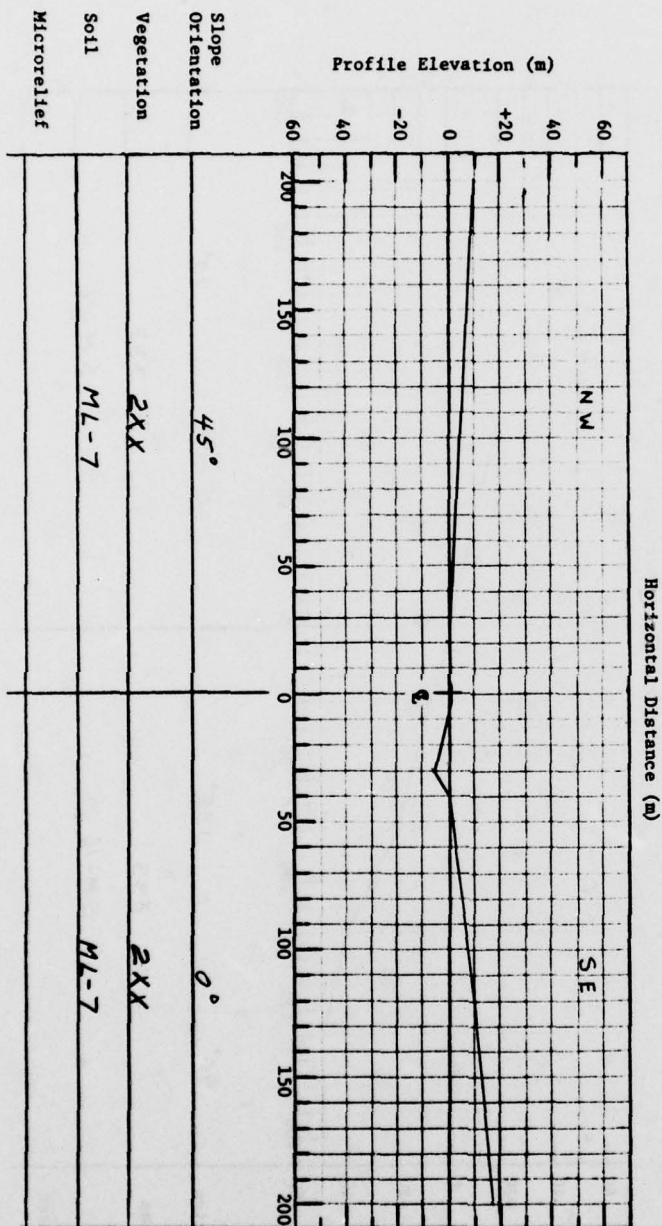


Construction:

Traffic Surface				Shoulder	
Width (m)	Surface	Material	Thick (cm)	Width (m)	Material
	Base	Gravel			
	Subbase				
2.4					

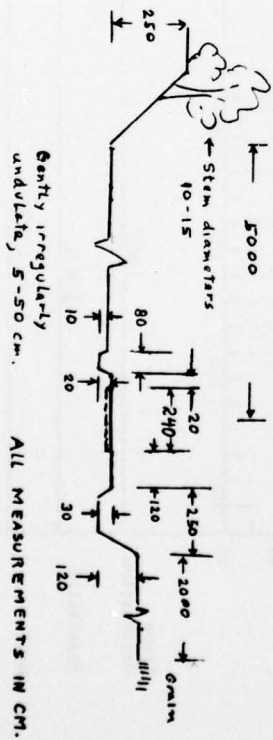
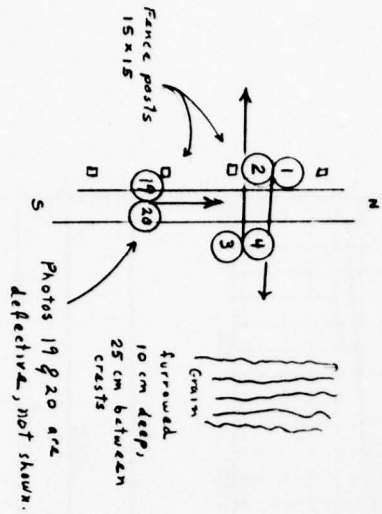
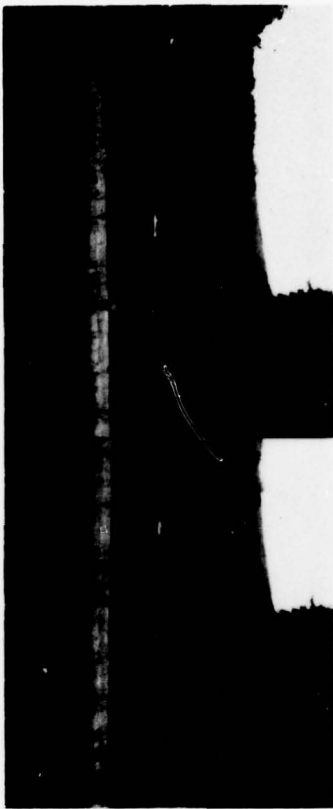
Instruction: On transect profile sketch show

location of important features,  
such as stream crossings, ditches,  
etc.



SITE 28 - PROFILE DATA

ALL



SITE 28

A45

Sample Number: 29

Date: 3 Sept 74

Map Number: L5316

Scale: 1:50000

Coordinate Location:

Geographic: 50°46'00"N UTM Ref.:

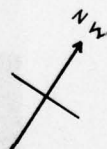
Landscape: Forested & cultivated upland 08°36'43"E

Road: Class: 2

Direction: NW

Site Type: 2

Notes and Comments:

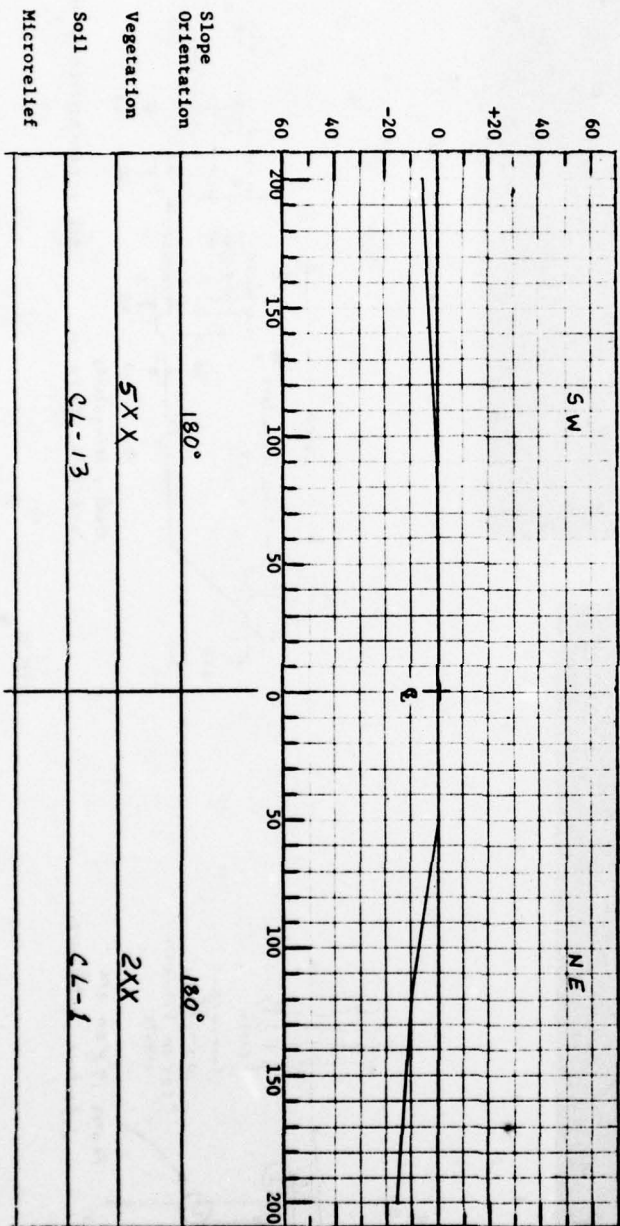


Construction:

Width (m)	Traffic Surface *			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
18	Base	Black Top		2	
	Subbase				

\* Data from field observation. See sketch, page A150.  
Horizontal Distance (m)

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



SITE 29 - PROFILE DATA

A46



Sample Number: 30

Date: 3 Sept 74

Map Number: 45316

Scale: 1:50000

Coordinate Location:

Geographic: 50°46'30"N UTM Ref.:

Landscape: Forested & cultivated hill

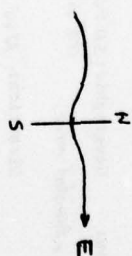
08°37'33"E

Road: Class: 5

Direction: E

Site Type: 2

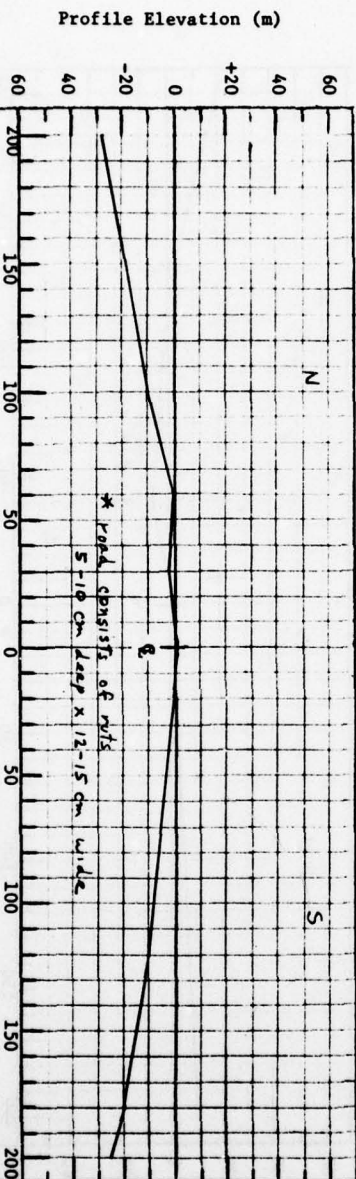
Notes and Comments:



Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.

\* from field observation Aug 1974

Construction:	Traffic Surface				Shoulder	
	Width (m)	Surface	Material	Thick (cm)	Width (m)	Material
* cuts		Base	* soil			
		Subbase				



Slope Orientation	150°	180°
Vegetation	4XX	2XX
Soil	ML-12 (* clay loam,	with angular ML-7
Microrelief	rock chips less than 3 cm diam.)	

SITE 30 - PROFILE DATA

Alt 7



Sample Number: 32

Date: 3 Sept 74

Map Number: 5219

Scale: 1:25000

Coordinate Location:

Geographic: 50°44'00" N UTM Ref.: 08°55'10" E

Landscape: Forested hill slope

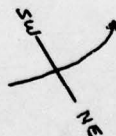
Road: Class: 5

Direction: NW

Site Type: 4

Notes and Comments:

Sources:  
Map



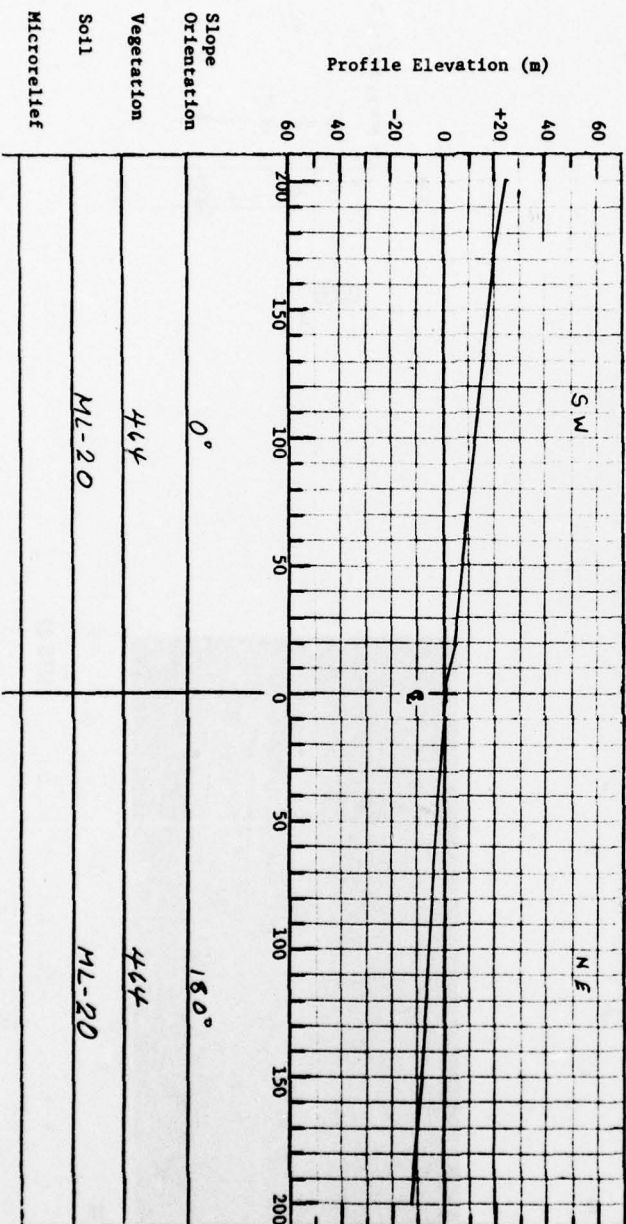
\* Ground observation Aug. 1974

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.

Construction:

Width (m)	Traffic Surface		Shoulder	
	Surface #	Material Thick (cm)	Width (m)	Material
* S	Base	Thn. gravel		
	Subbase			

Horizontal Distance (m)



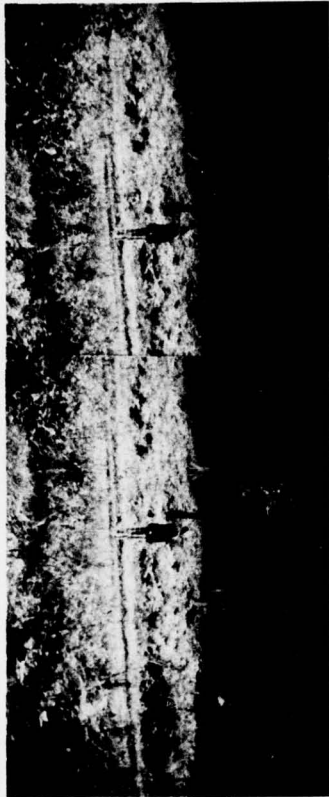
SITE 32 - PROFILE DATA

A49



10

9

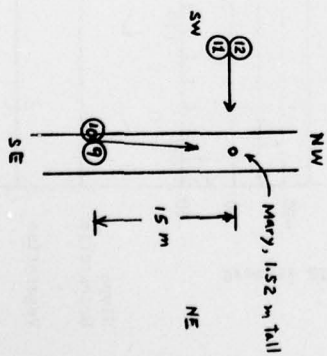
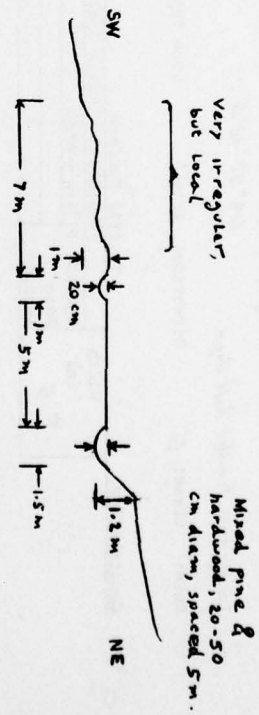


12

11

SITE 32

ASO





Sample Number: 33

Date: 3 Sept 74

Map Number: 5219

Scale: 1:25000

Coordinate Location:

Geographic: 50°44'00"N UTM Ref.:

Landscape:

08°55'23"E

Road: Class: 5

Direction: N

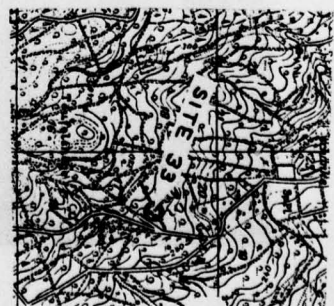
Site Type: 2

Notes and Comments:

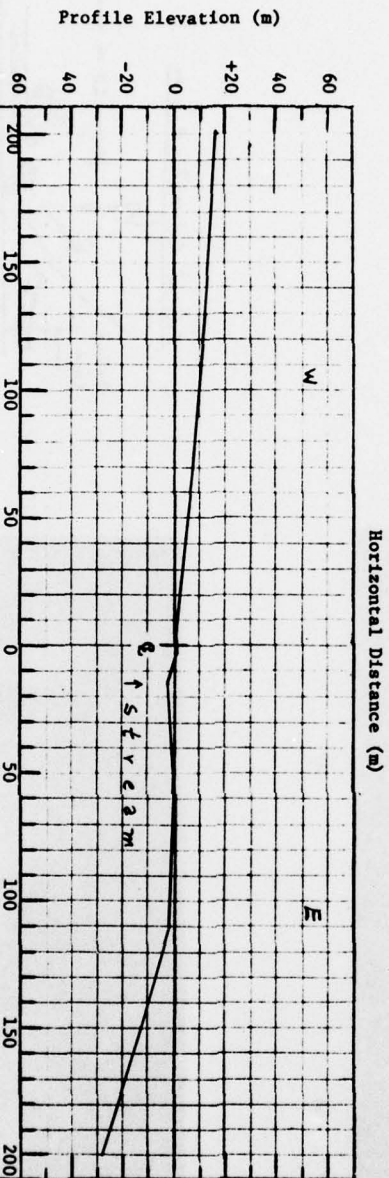
Sources:

Map 1964  
(1943 data)

\* Field observation,  
Aug 1974.



Construction:	Width (m)	Traffic Surface			Shoulder	
		Surface	Material	Thick (cm)	Width (m)	Material
* 2.5		Base				
		Subbase				



Slope Orientation	90°	120°
Vegetation	464	464
Soil	ML-20	ML-20
Microrelief		

SITE 33 - PROFILE DATA

A51

Sample  
Map N  
Coord  
Land  
Road:  
Const



21

11



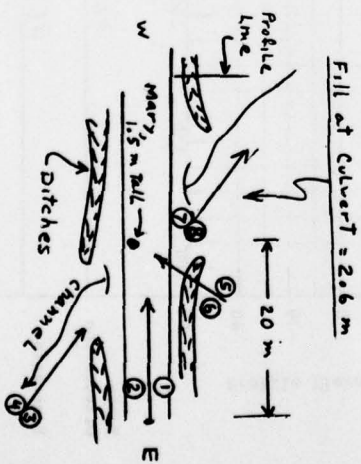
Profile across side ditch



6

5

SITE 33 (Sheet 1 of 2)





4

3



7

8

SITE 33 (Sheet 2 of 2)

A53

Profile Elevation (m)

Slope  
Orienta  
Vegetat  
Soil  
Microre

Sample Number  
Map Number: 4  
Coordinate L  
Landscape: C  
Road: Class  
Construction

Sample Number: 34

Date: 3 Sep 74

Map Number: 5219

Scale: 1:25000

**Coordinate Location**

Geographic: 50°43'58" N UTM Ref.:

Landscape: Cultivated lowland

08° 58' 18" E

Road: Class: 3

Direction: NW

Site Type: 4

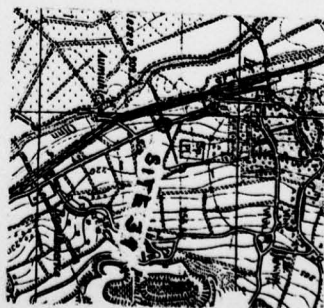
**Notes and Comments:**

**Sources:**

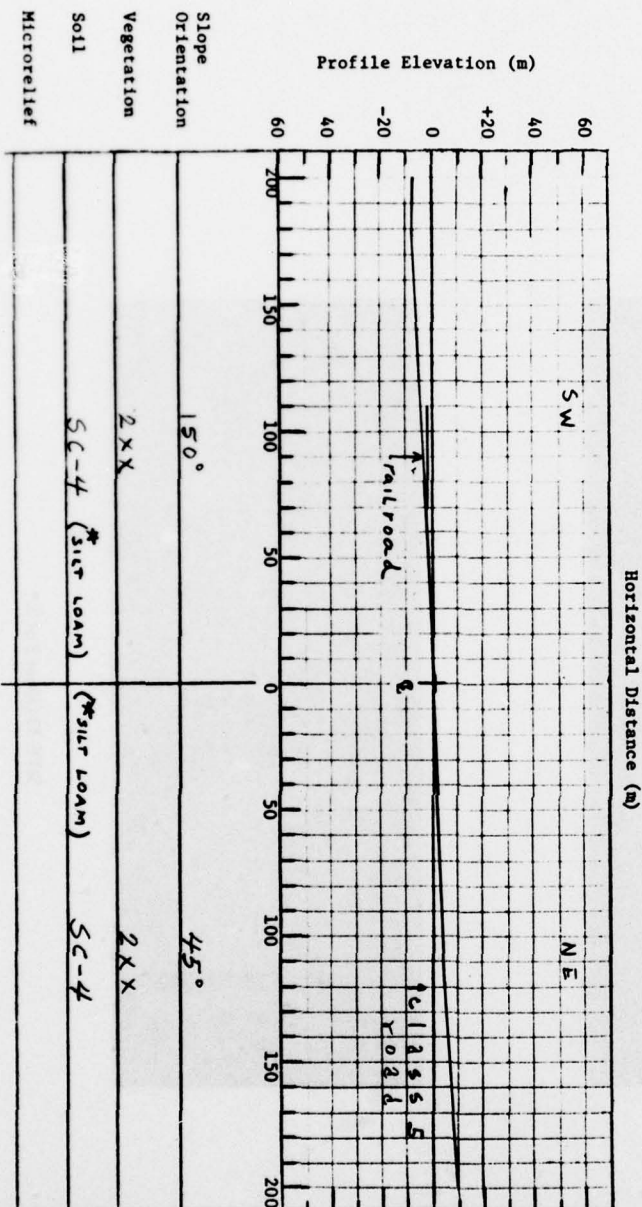
Map: 19

Air photos 19

\* field observation  
Aug 1974



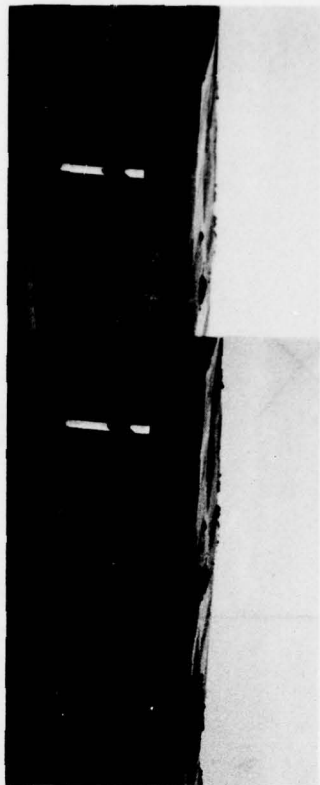
Construction:		Traffic Surface		Shoulder	
Width (m)		Material	Thick (cm)	Width (m)	Material
	Surface				
	Base				
	Subbase				



SITE 34 - PROFILE DATA

A54





16

15

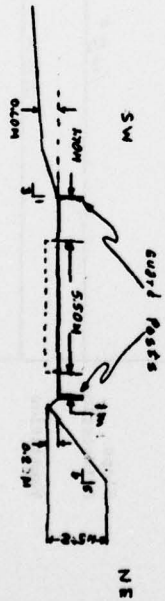
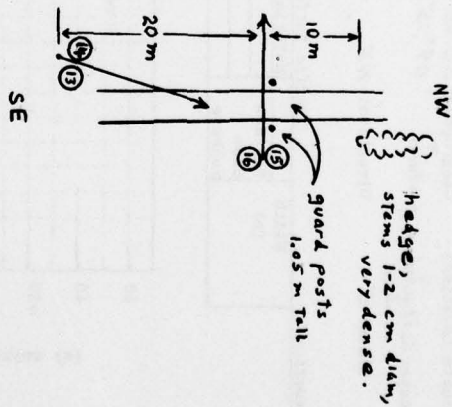


14

13

SITE 34

A55



Profile Elevation (m)

Slope  
Orienta  
Vegetat  
Soil  
Microre

Sample Number  
Map Number: 4  
Coordinate L  
Landscape: C  
Road: Class  
Construction

Sample Number: 35

Date: 3 Sept 74

Map Number: 5221

Scale: 1:25000

**Coordinate Location:**

Geographic: 50°45'17"N UTM Ref.:

Landscape: Cultivated a pasture  
lowland

09-1300E

Road: Class: 5

**Direction: NE**

Site Type: 4

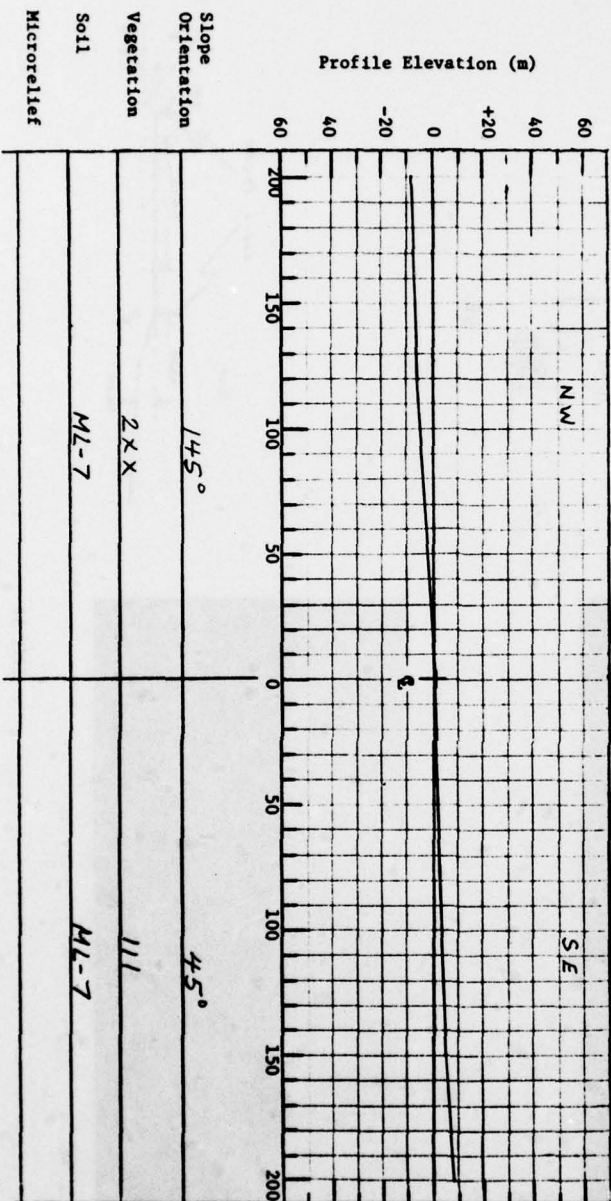
**Notes and Comments:**

**Instruction:** On transect profile sketch show location of important features, such as stream crossings, ditches, etc.

Construction:

Traffic Surface			Shoulder	
Width (m)	Material	Thick (cm)	Width (m)	Material
Surface				
Base				
Subbase				

Horizontal Distance (m)



### SITE 35 - PROFILE DATA

A56

### Sampl

Map N

Coord

Lands

**Road:**

### Constri

Sample Number: 36

Map Number: 5221

Scale: 1:25000

Date: 3 Sept 74

Coordinate Location:

Geographic: 50°45'23"N UTM Ref.:

Landscape: C. Hatched lowland

09°15'10"E

Road: Class: 2

Direction: NW

Site Type: 4

Notes and Comments:

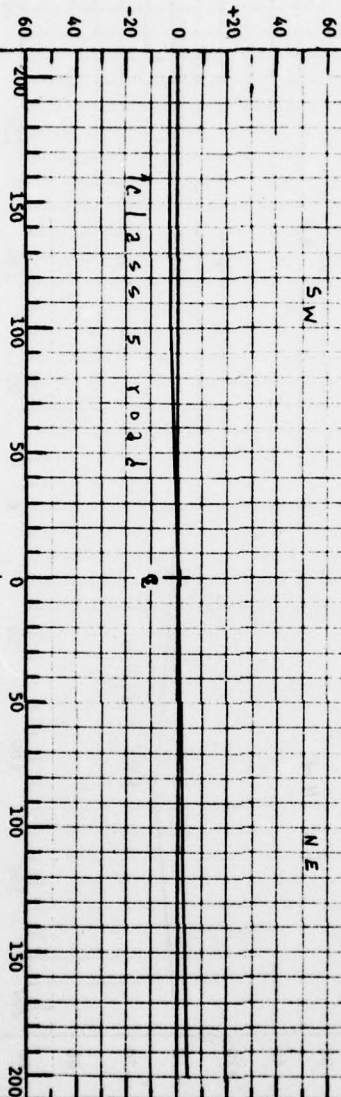


Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width	Material
	Base				
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.

Profile Elevation (m)



Horizontal Distance (m)

Slope  
Orientation

Vegetation

Soil

Microrelief

40°

2 X X

ML-7

45°

2 X X

ML-7

SITE 36 - PROFILE DATA

A57

Profile Elevation (m)

Slope  
Orient

Vegeta

Soil

Micro

Sample Num

Map Number:

Coordinate

Landscape:

Road: Cla

Constructio

Sample Number: 37

Date: 3 Sept 74

Map Number: 5221

Scale: 1:25000

Coordinate Location:

Geographic: 50°46'07"N UTM Ref.:

Landscape: Cultivated

lowland 09°15'00"E

Road: Class: 4

Direction: NE

Site Type: 4

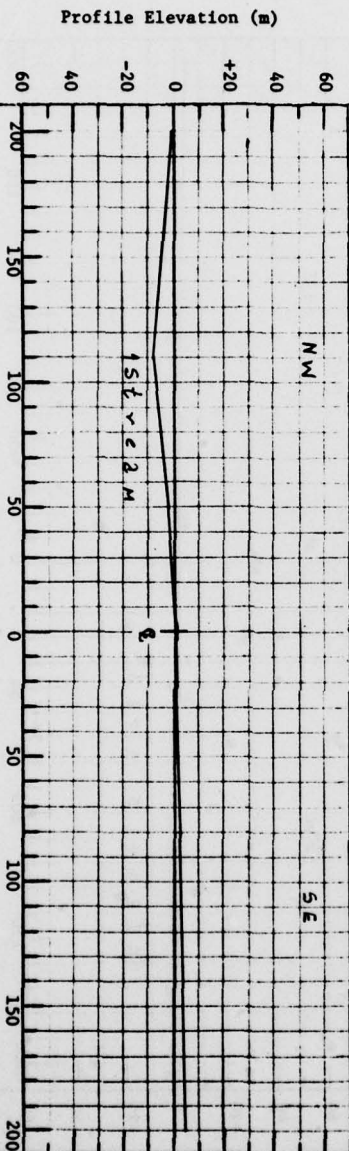
Notes and Comments:

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.

Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Horizontal Distance (m)



Slope Orientation  
Vegetation  
Soil  
Microrelief

30°	2XX	OL-4
45°	2XX	OL-4

SITE 37 - PROFILE DATA

A58



Sample Number: 38

Date: 3 Sept 74

Map Number: 5221

Scale: 1:25000

Coordinate location:

Geographic: 50°44'17"N UTM Ref.: 09°15'00"E

Landscape: Cultivated lowland

Road: Class: 3

Direction: NW

Site Type: 4

Notes and Comments:

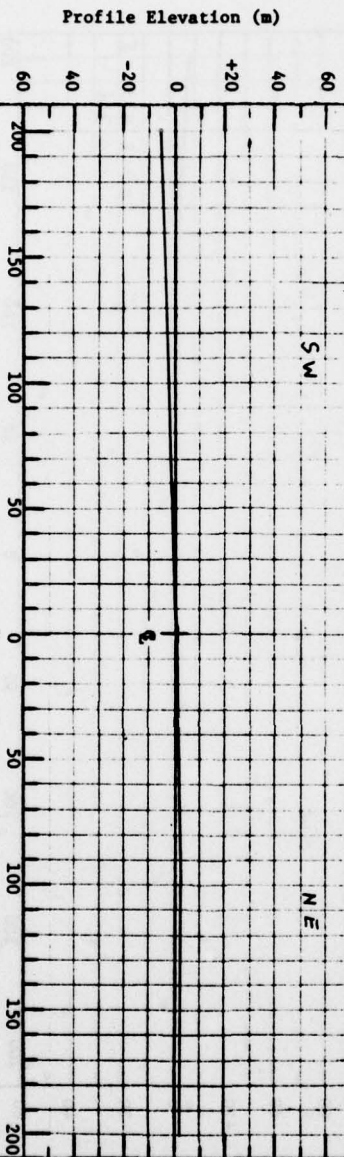


Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.

Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Horizontal Distance (m)



Slope Orientation	135°	45°
Vegetation	2 X X	2 X X
Soil	OL-4	OL-4
Microrelief		

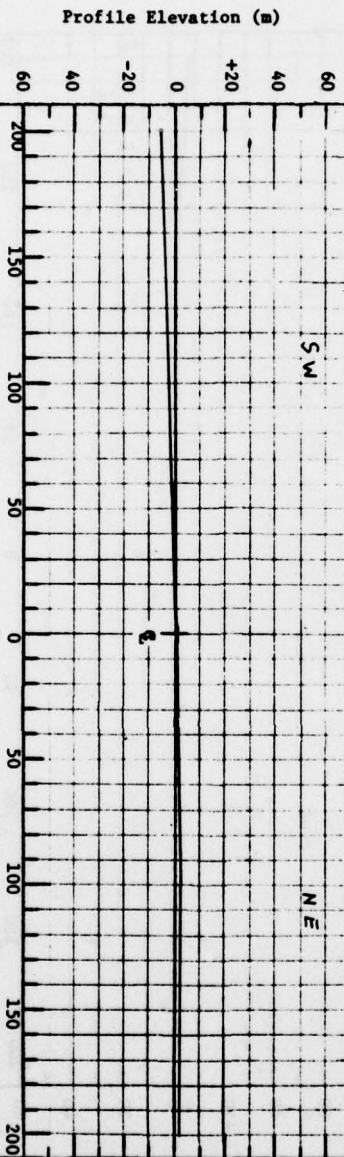
SITE 38 - PROFILE DATA

A59

Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Horizontal Distance (m)



Slope Orientation	135°	45°
Vegetation	2 X X	2 X X
Soil	OL-4	OL-4
Microrelief		

SITE 38 - PROFILE DATA

A59

Sample Number: 39

Date: 4 Sept 74

Map Number: 5223

Scale: 1:25000

Coordinate Location:

Geographic: 50°45'03"N UTM Ref.:

Landscape: Pasture + cultivated  
flood plain

09°35'13"E

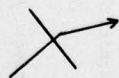
Road:

Class: 5

Direction: NW

Site Type: 1

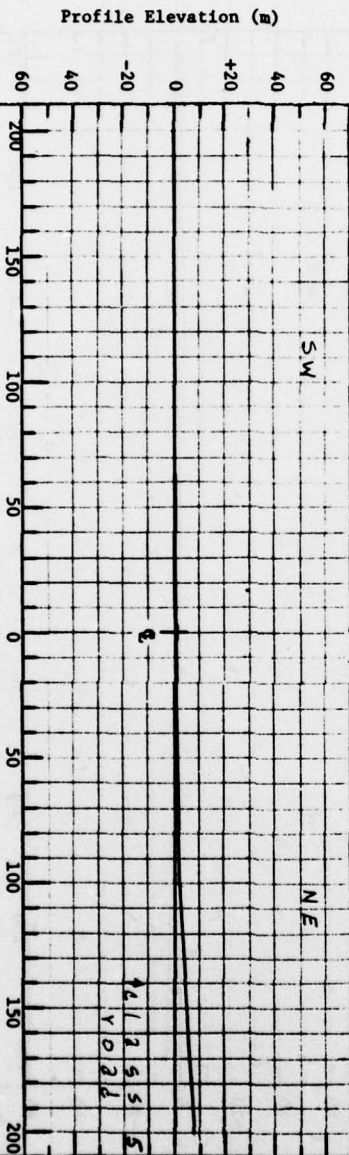
Notes and Comments:



Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.

Construction:	Traffic Surface				Shoulder	
	Width (m)	Surface	Material	Thick (cm)	Width (m)	Material
		Base				
		Subbase				

Horizontal Distance (m)



Slope Orientation	180°	0°
Vegetation	2X4	2X4
Soil	OL-4	OL-4
Microrelief		

SITE 39 - PROFILE DATA

A60

Sample Number: 40

Date: 4 Sept 74

Notes and Comments:

Map Number: 5223

Scale: 1:25000

Coordinate Location:

Geographic: 50°45'10"N UTM Ref.:

Landscape: *Chuvanted rocky slope*

09°35'18"E

Road: Class: 3

Direction: N

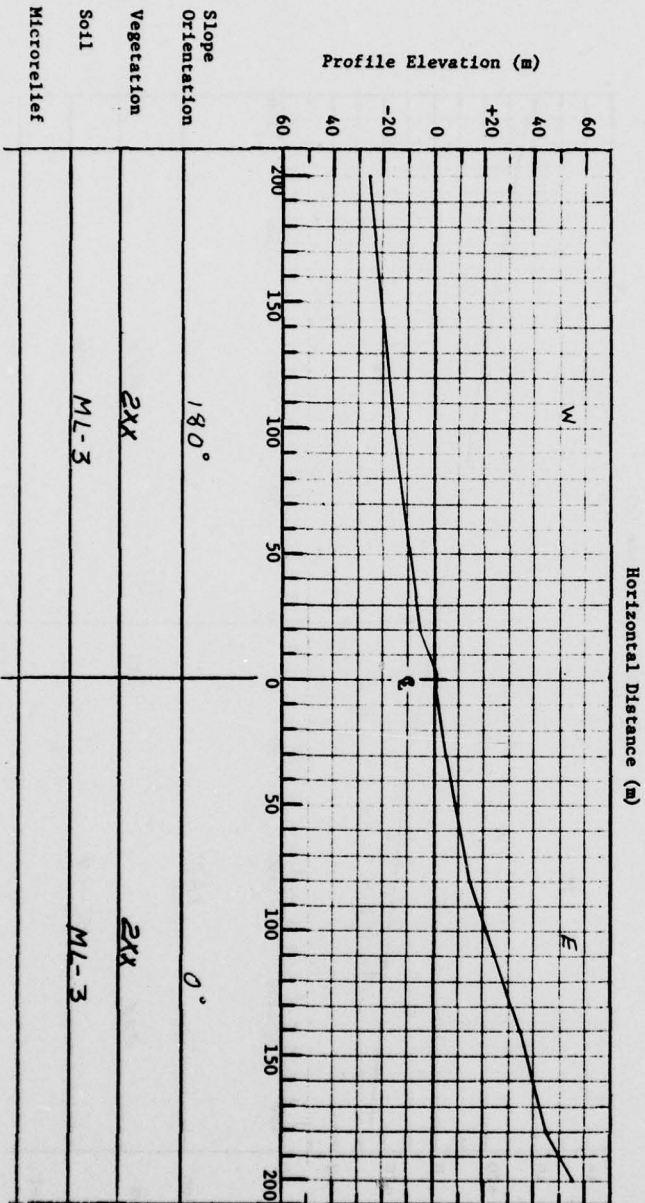
Site Type: 4



Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width	Material
	Base				
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



SITE 40 - PROFILE DATA

A61

very  
dense  
brush  
& weeds

Sample Number: 41

Date: 4 Sept 74

Notes and Comments:

Map Number: 5223

Scale: 1:25000

Coordinate Location:

Geographic: 50°45'23" UTM Ref.:

Landscape: Cultivated & forested hills

09035'41"

Road: Class: 4

Direction: E

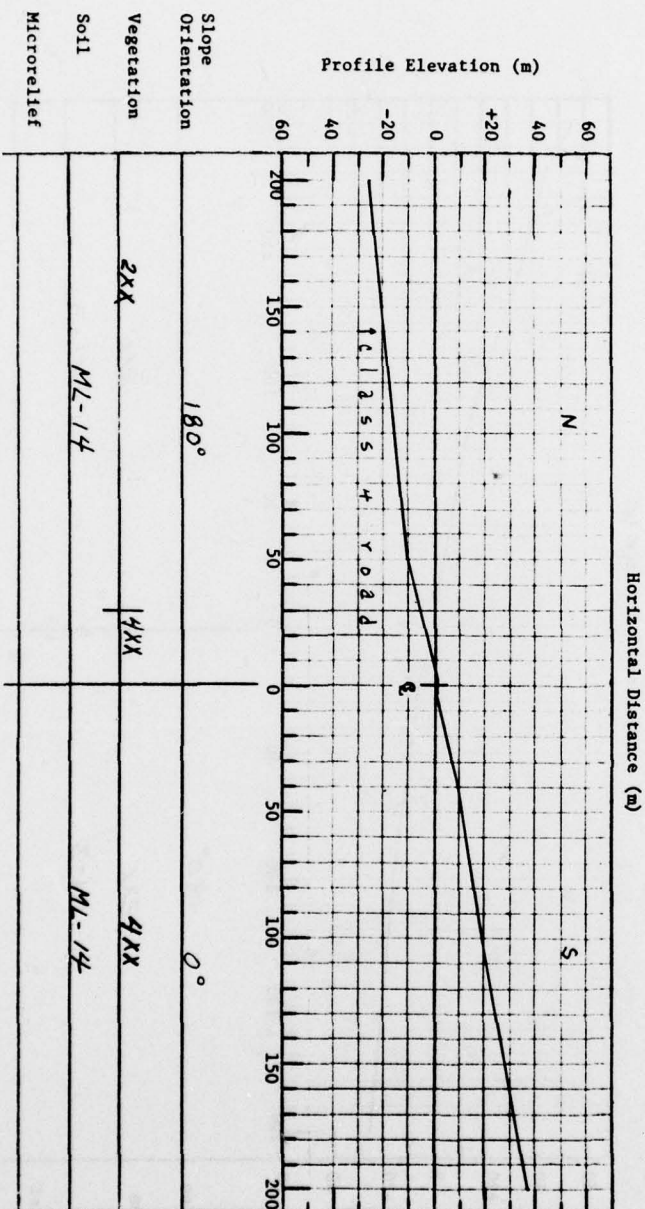
Site Type: 4



Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



SITE 41 - PROFILE DATA

A62



Sample Number: 42

Date: 4 Sept 74

Map Number: 5225

Scale: 1:25000

Coordinate Location:

Geographic: 50°45'00"N UTM Ref.:

Landscape: Forested + cultivated hillsides

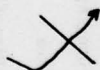
09°55'24"E

Road: Class: 3

Direction: NW

Site Type: 1

Notes and Comments:

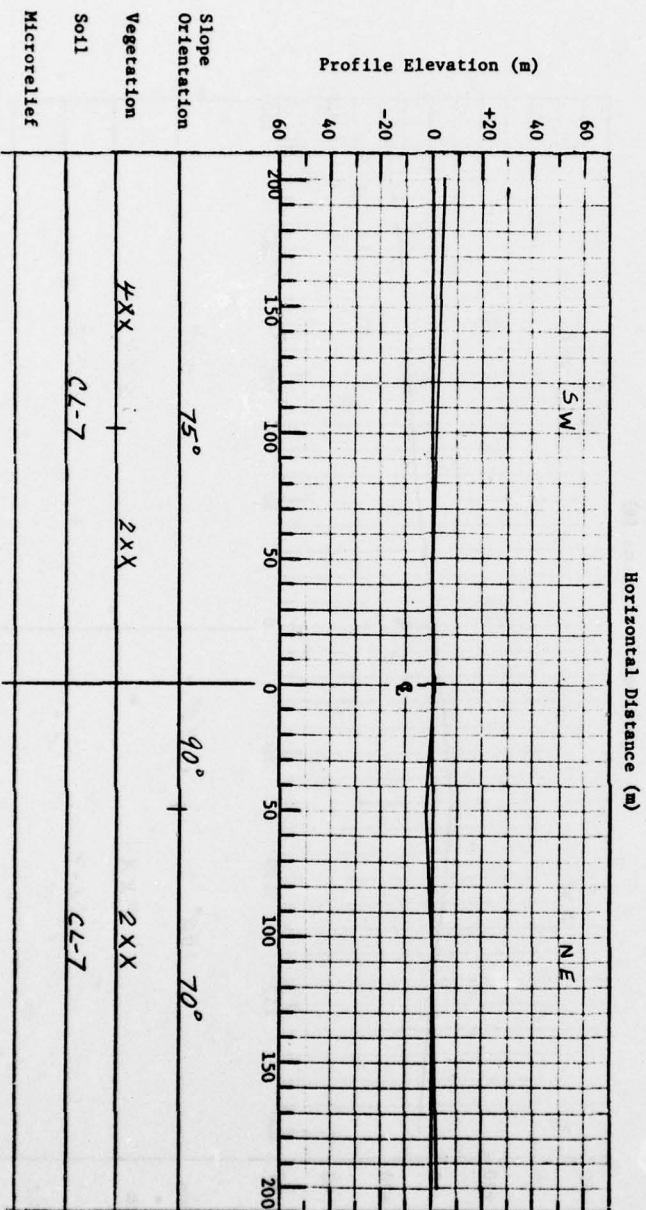


Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction:

On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



SITE 42 - PROFILE DATA

A63

Date: 4 Sept 74

Scale: 1:25000

Geographic: 50°45'00" N UTM Ref.:

07 33 702

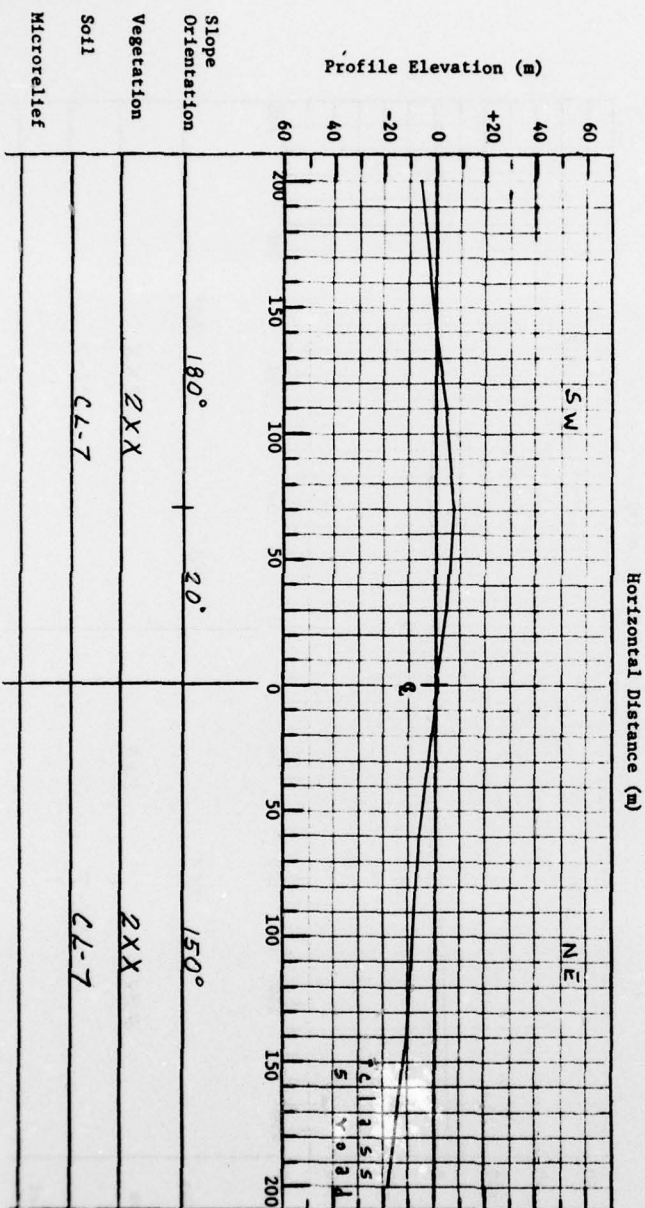
Direction: NW

Site Type: 2/3

**Notes and Comments:**

**Instruction:** On transect profile sketch show location of important features, such as stream crossings, ditches, etc.

Construction:		Traffic Surface		Shoulder	
Width (m)	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				



SITE 43 - PROFILE DATA

A64

Sample Number: 44

Date: 4 Sept 74

Notes and Comments:

Map Number: 5225

Scale: 1:25,000

Coordinate Location:

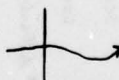
Geographic: 50°45'00"N UTM Ref.:

Landscape: Forested & cultivated hillside

Road: Class: 4

Direction: N

Site Type: 4

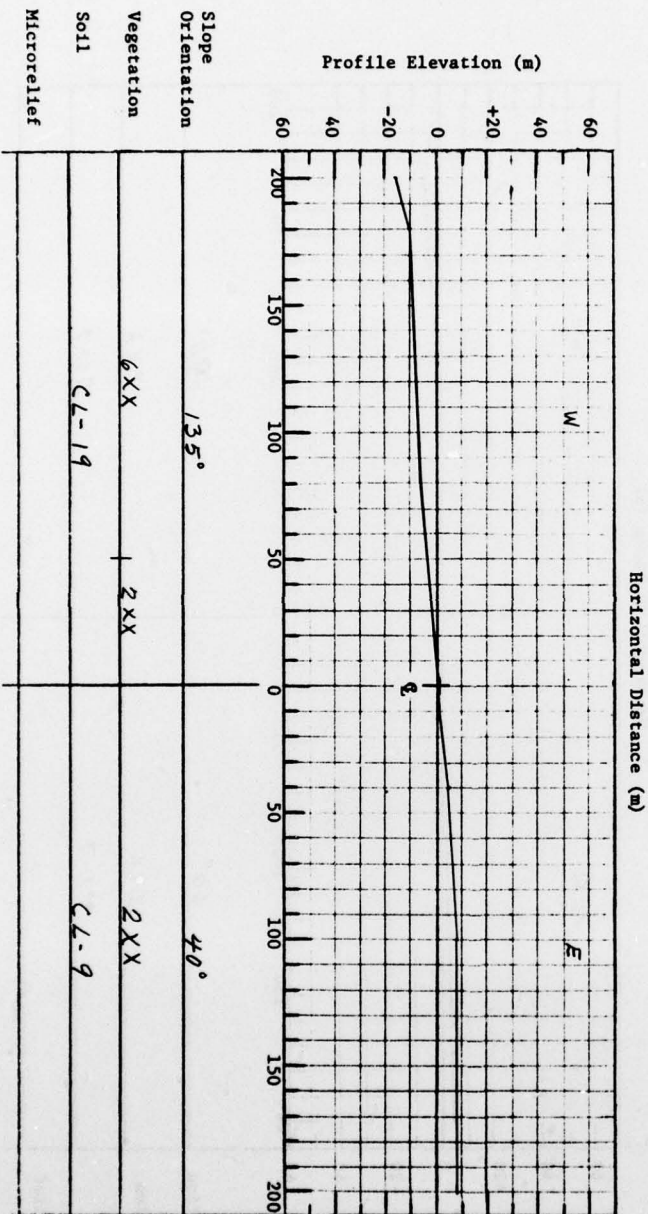


Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction:

On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



SITE 44 - PROFILE DATA

A65

Sample Number: 45

Date: 4 Sept 74

Map Number: 5225

Scale: 1:25000

Coordinate location:

Geographic: 50°45'00"N UTM Ref.:

Landscape: Cultivated hillside

09°56'42"E

Road: Class: 2

Direction: NE

Site Type: /

Notes and Comments:

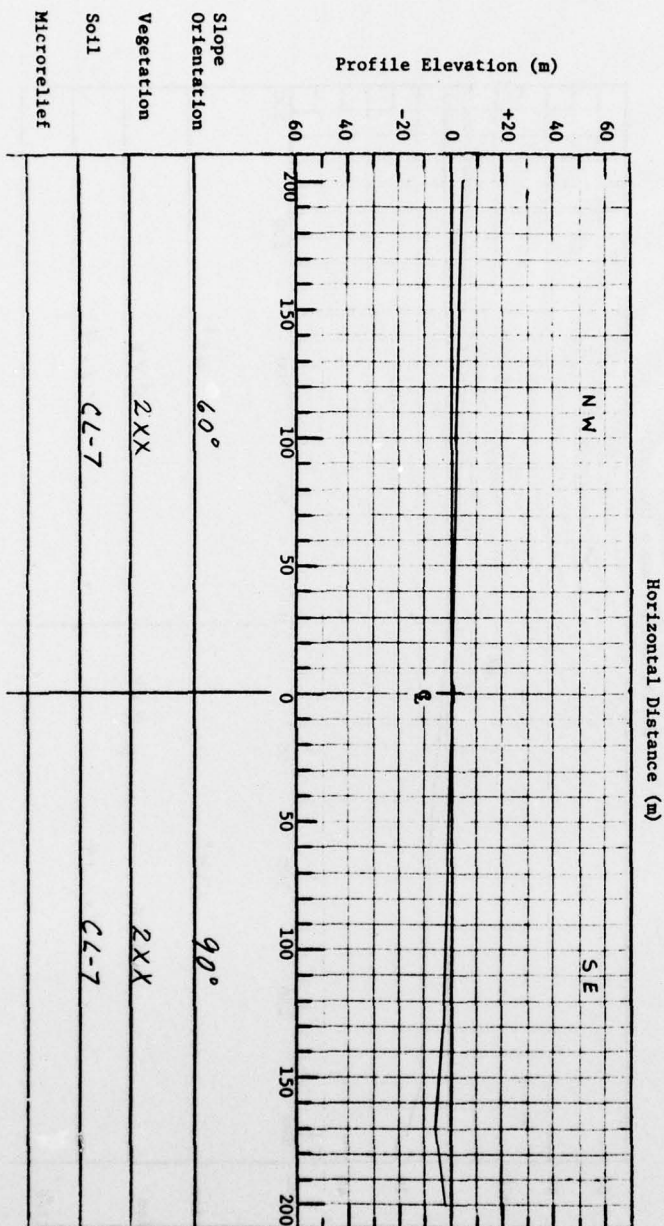


Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction:

On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



SITE 45 - PROFILE DATA



Sample Number: 46

Date: 4 Sept 74

Notes and Comments:

Map Number: L5514

Scale: 1:50000

Coordinate Location:

Geographic: 50°33'00" N UTM Ref.:

Landscape: Cultivated hillsite

08°15'14"E

Road: Class: 5

Direction: NW

Site Type: 3/2

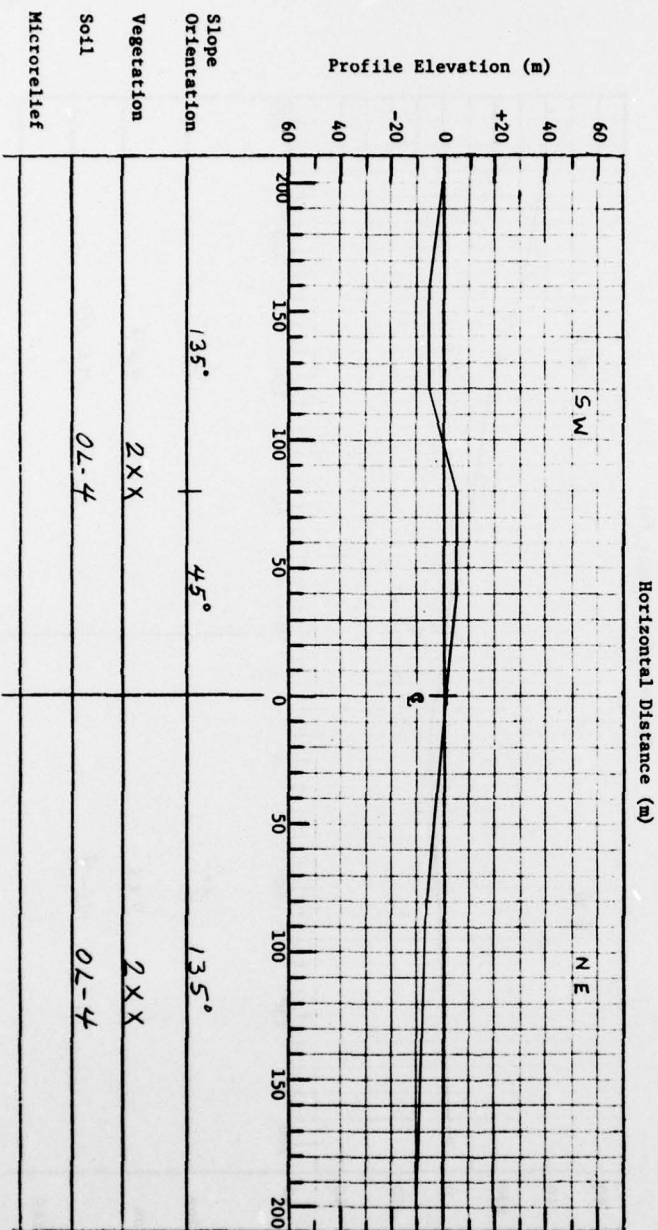


Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction:

On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



SITE 46 - PROFILE DATA

A67

Sample Number: 47

Date: 4 Sept 74

Notes and Comments:

Map Number: L5514

Scale: 1:50000

Coordinate Location:

Geographic: 50°33'00" N UTM Ref.:

Landscape: Cultivated ~~hilly~~ <sup>hilly</sup> ~~hilly~~ <sup>hilly</sup>

08°15'25"E

Road: Class: 3

Direction: NW

Site Type: 3

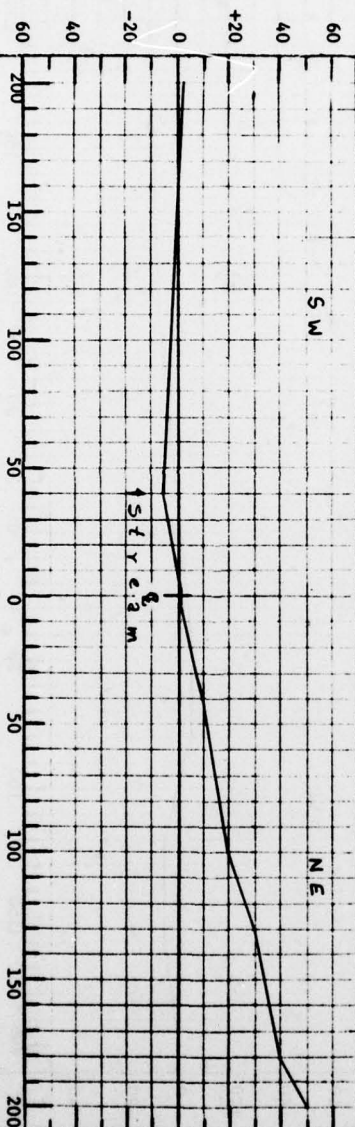
Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



Profile Elevation (m)



Slope  
Orientation

0°

45°

Vegetation

2XX

454

Soil

ML-9

ML-10

Microrelief

SITE 47 - PROFILE DATA

A68

Sample Number: 48

Date: 4 Sept 74

Notes and Comments:

Map Number: L5514

Scale: 1:50000

Coordinate Location:

Geographic: 50°33'00"N UTM Ref.:

Landscape: Cultivated valley bottom

08°15'16"E

Road: Class: 4

Direction: NE

Site Type: 3/2

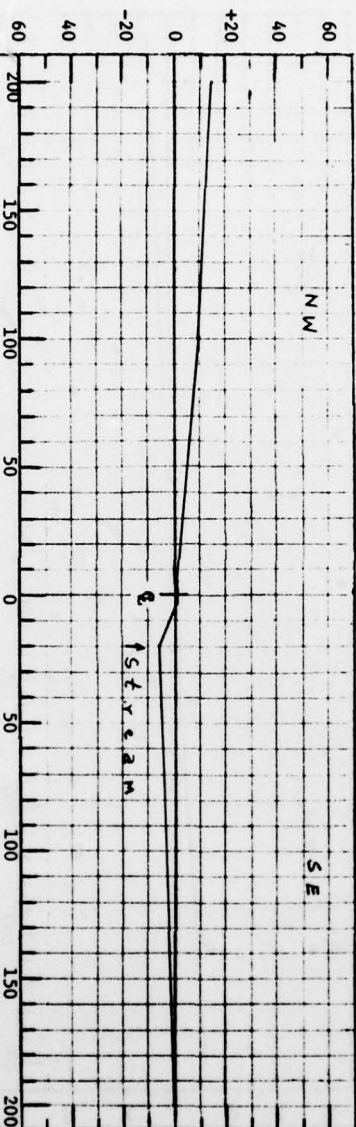
Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width	Material
	Base				
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



Profile Elevation (m)



Slope  
Orientation

0°

75°

Vegetation

2 x X

2 x X

Soil

OL-4

OL-4

Microrelief

SITE 48 - PROFILE DATA

A69



Sample Number: 49

Date: 4 Sept 74

Notes and Comments:

Map Number: LSS16

Scale: 1:50000

Coordinate Location:

Geographic: 50°33'22"N UTM Ref.:

Landscape: Cultivated 4/1 slope

08°35'00"E

Road: Class: 5

Direction: NE

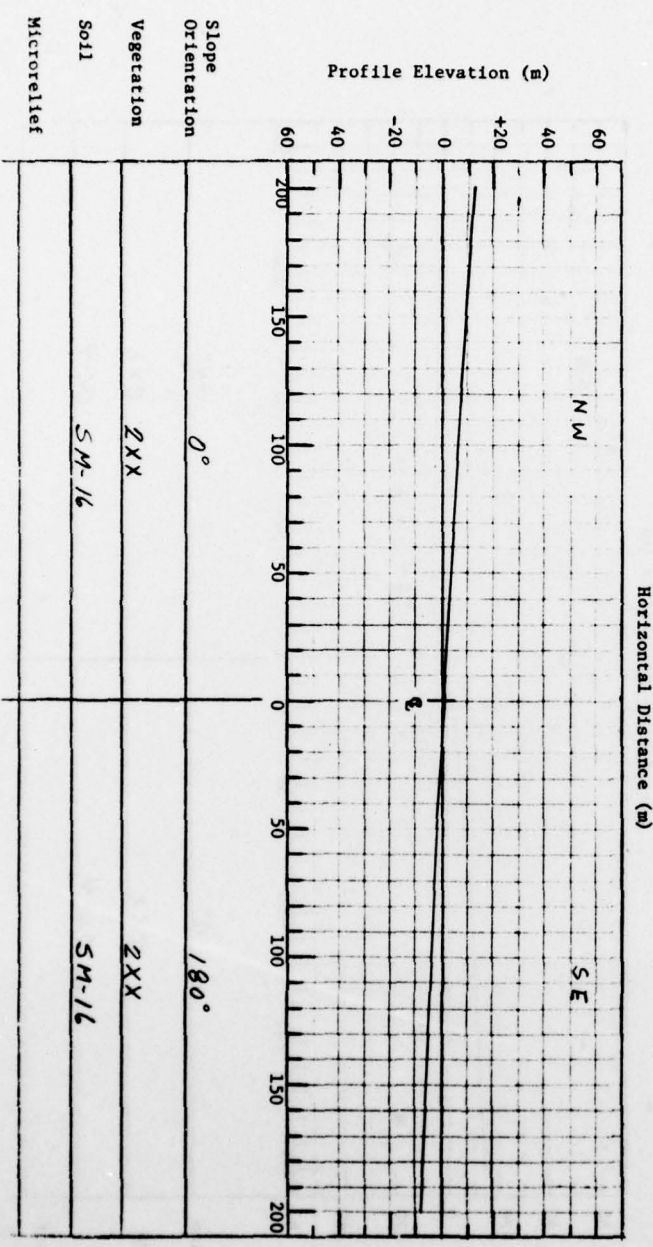
Site Type: 4

Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width	Material
	Base				
	Subbase				

Instruction:

On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



SITE 49 - PROFILE DATA

ATO



Sample Number: 50

Date: 4 Sept 74

Map Number: 45516

Scale: 1:50000

Coordinate Location:

Geographic: 50°33'32"N UTM Ref.:

Landscape: Cultivated hill slope

08°35'00"E

Road: Class: 2

Direction: NE

Site Type: 2

Notes and Comments:

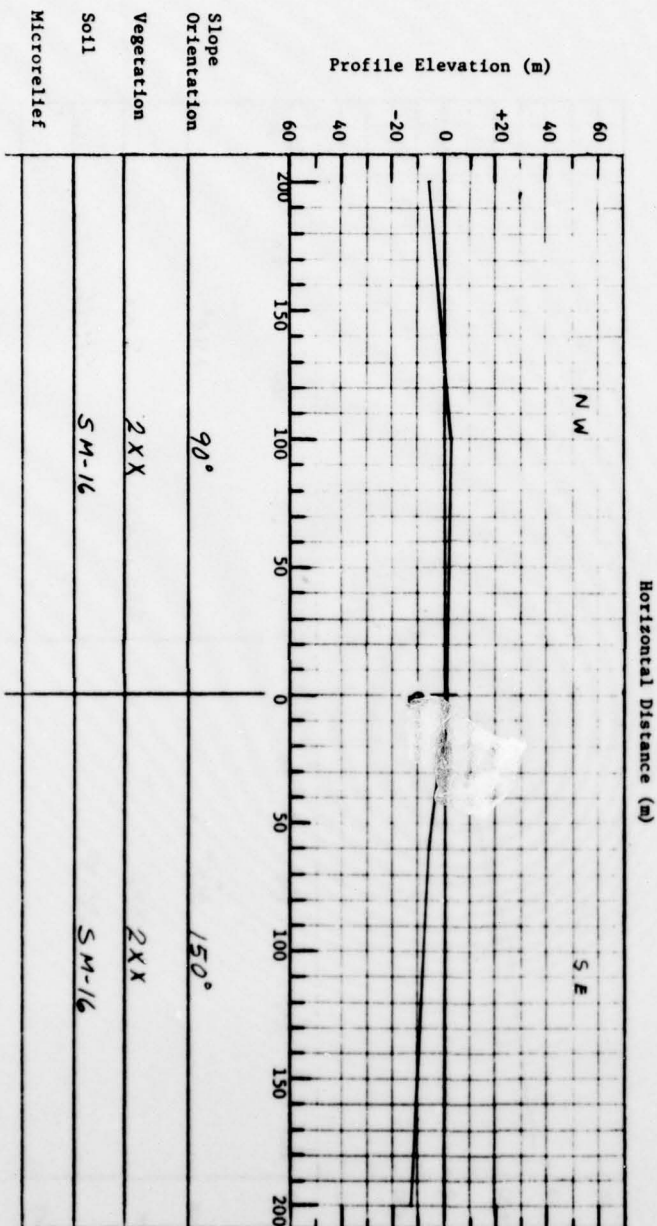


Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width	Material
	Base				
	Subbase				

Instruction:

On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



SITE 50 - PROFILE DATA

ATL

Sample Number: 51

Date: 4 Sept 74

Map Number: 25516

Scale: 1:50000

Coordinate location:

Geographic: 50°34'03"N UTM Ref.:

Landscape: Forested hillside, pasture floodplain

08°35'00"E

Road: Class: 3

Direction: NW

Site Type: 3

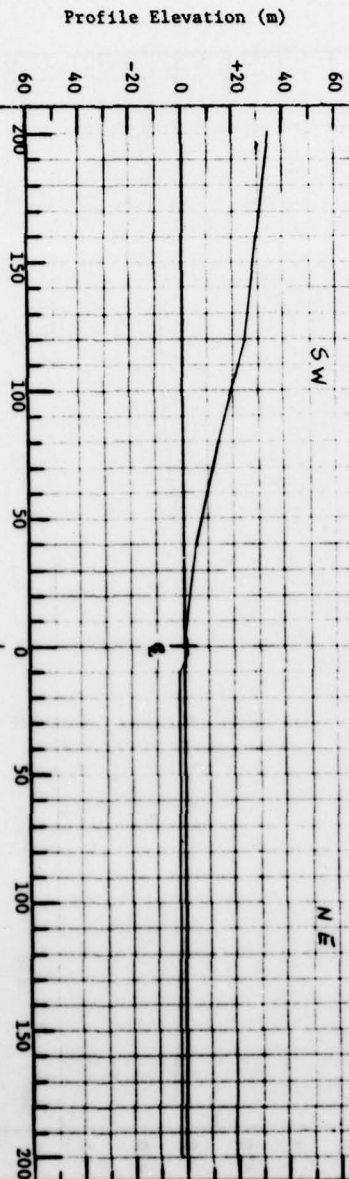
Notes and Comments:



Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Horizontal Distance (m)



Slope Orientation

Vegetation

Soil

Microrelief

45°

446

02-4

180°

2XX, 443,

2XX

SM-16

SITE 51 - PROFILE DATA

A72

Sample Number: 52

Date: 4 Sept 74

Notes and Comments:

Map Number: 45516

Scale: 1:50000

Coordinate Location:

Geographic: 50° 35' 13" N UTM Ref.:

Landscape: Cultivated valley slopes

08° 35' 00" E

Road: Class: 4

Direction: NW

Site Type: 3

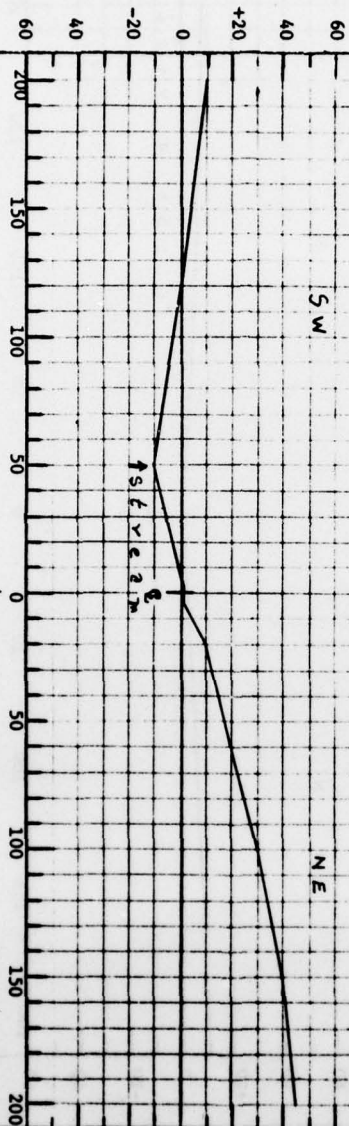
Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



Profile Elevation (m)



Slope  
Orientation

0°

Vegetation

2XX

Soil

0L-6

Microrelief

0°

2XX

0L-17

SITE 52 - PROFILE DATA

A73



Sample Number: 53

Date: 6 Sept 74

Notes and Comments:

Map Number: L5518

Scale: 1:50000

Coordinate Location:

Geographic: 50° 33' 39" N UTM Ref.:

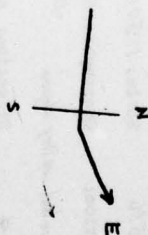
08° 56' 02" E

Landscape: Cultivated  
and forested upland

Road: Class: 5

Direction: E

Site Type: 3

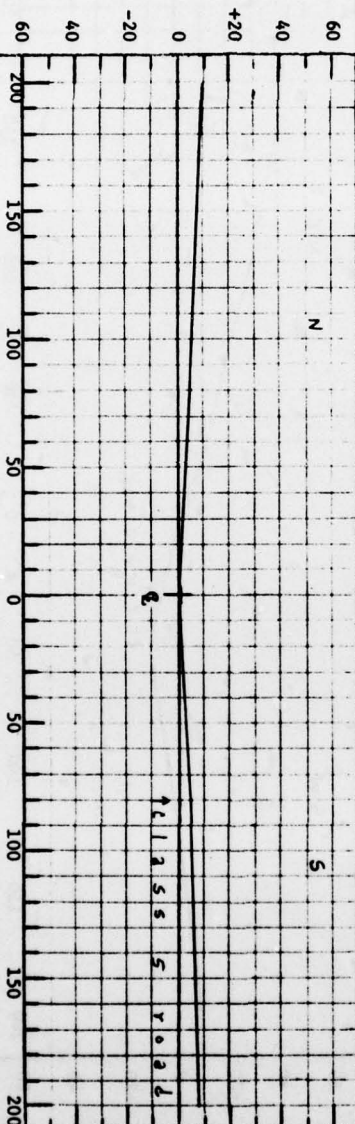


Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
* 3.5 m with curbs	Base	Soil			
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.

Profile Elevation (m)



Horizontal Distance (m)

\* from field observation Aug 1974

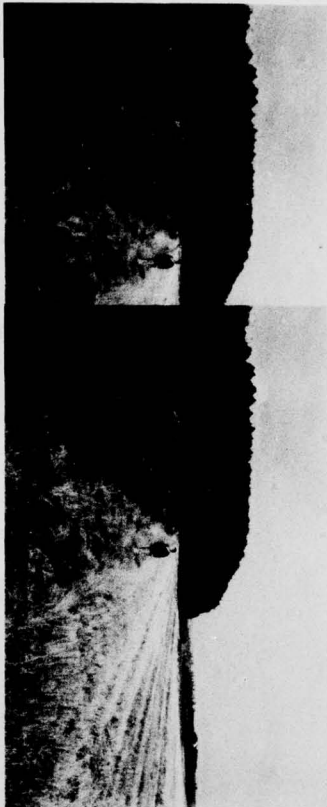
Slope  
Orientation  
Vegetation  
Soil  
Microrelief

30°	2XX	5XX	
45°	ML-7	ML-17	(* silty clay)
			ML-17

SITE 53 - PROFILE DATA

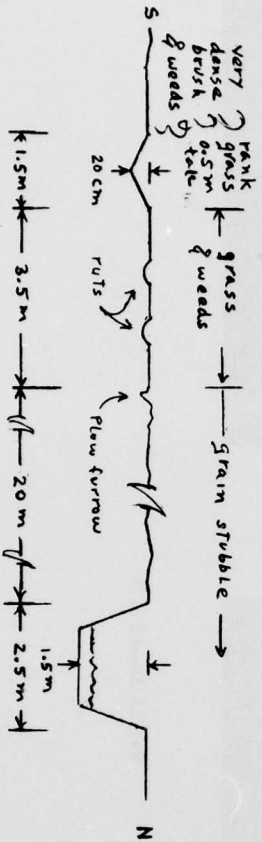
A714



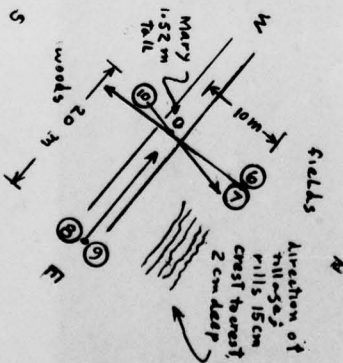


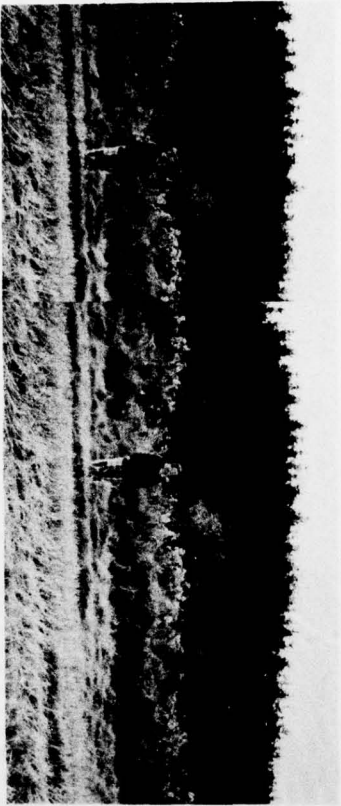
8

9



SITE 53 (Sheet 1 of 2)

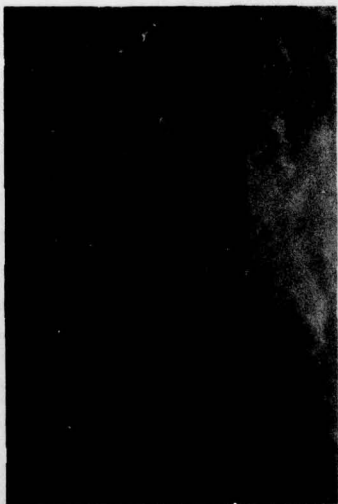




7

6

SITE 53 (Sheet 2 of 2)



10

A76

Sample Number: 54

Date: 6 Sept 74

Notes and Comments:

Map Number: 25518

Scale: 1:50000

Coordinate Location:

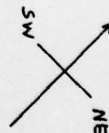
Geographic: 50°34'03" N UTM Ref.:  
08°56'49" E

Landscape: Cultivated  
upland

Road: Class: 4

Direction: NW

Site Type: 3



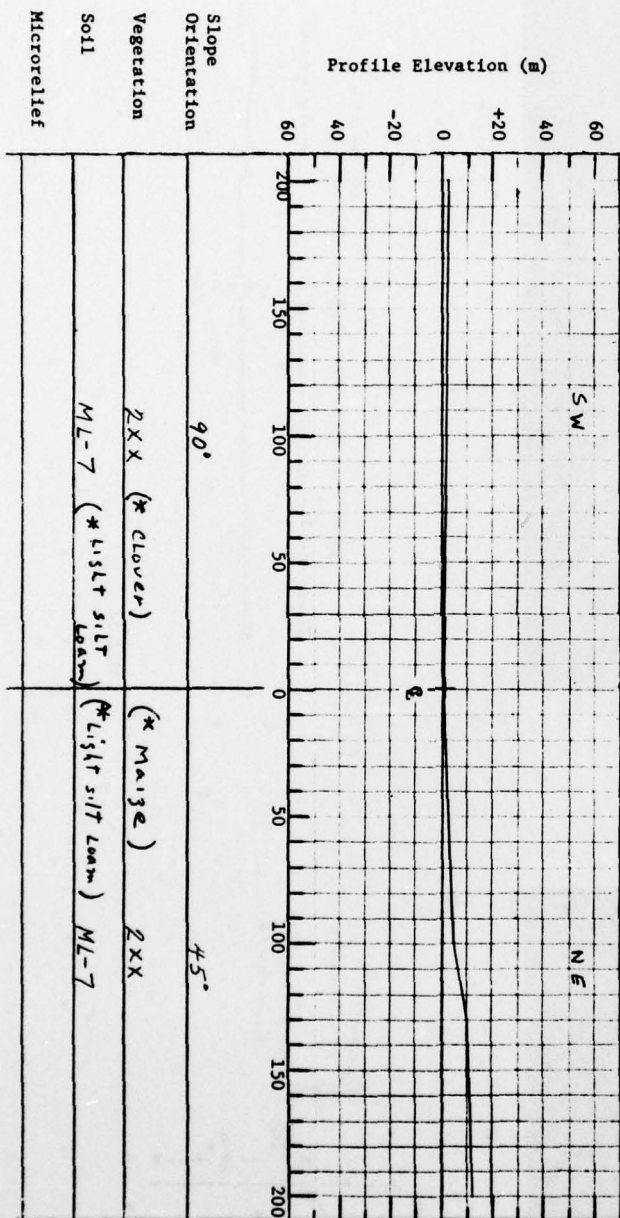
Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
* 2.5	Base	* Metalled			
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.

Horizontal Distance (m)

\* field observation, Aug 1974



SITE 54 - PROFILE DATA

A77

AD-A046 157

ARMY ENGINEER WATERWAYS EXPERIMENT STATION VICKSBURG MISS F/G 19/1  
DESCRIPTION OF TERRAIN TO BE USED IN EVALUATING THE LOFTED MINE--ETC(U)  
SEP 77 E E ADDOR, E E GARRETT

UNCLASSIFIED

WES-HP-M-77-11

NL

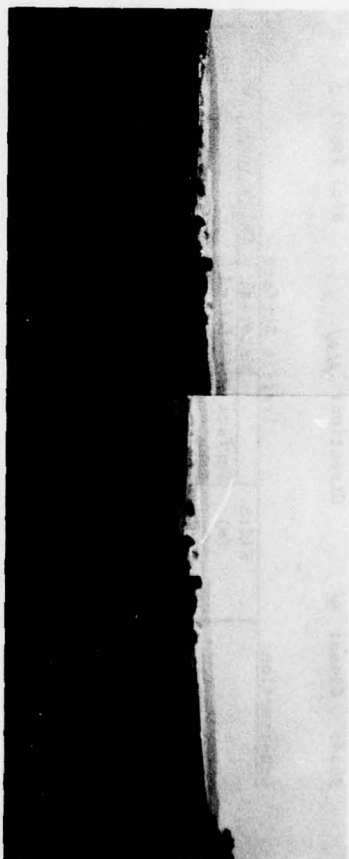
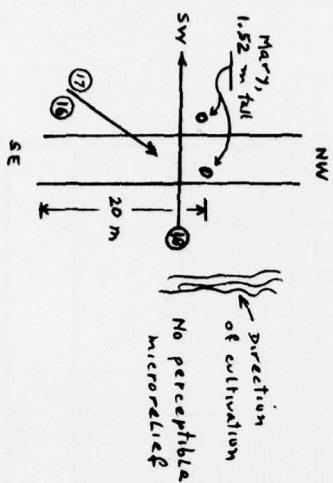
2 OF 2  
AD  
A046157





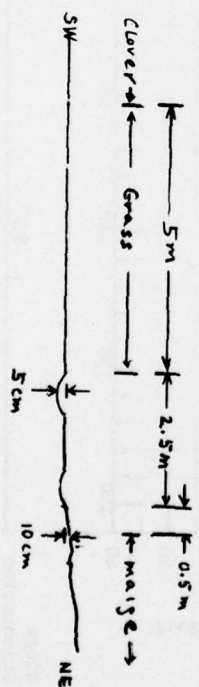


18



17

16



**SITE 54**

A78

Sample Number: 55

Date: 6 Sept 74

Notes and Comments:

Map Number: 45518

Scale: 1:50000

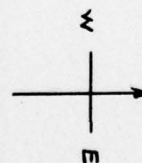
Coordinate Location:

Geographic: 50°34'23"N UTM Ref.:  
08°57'24"E

Landscape: Pasture  
and cultivated valley  
bottom

Direction: N

Site Type: 1

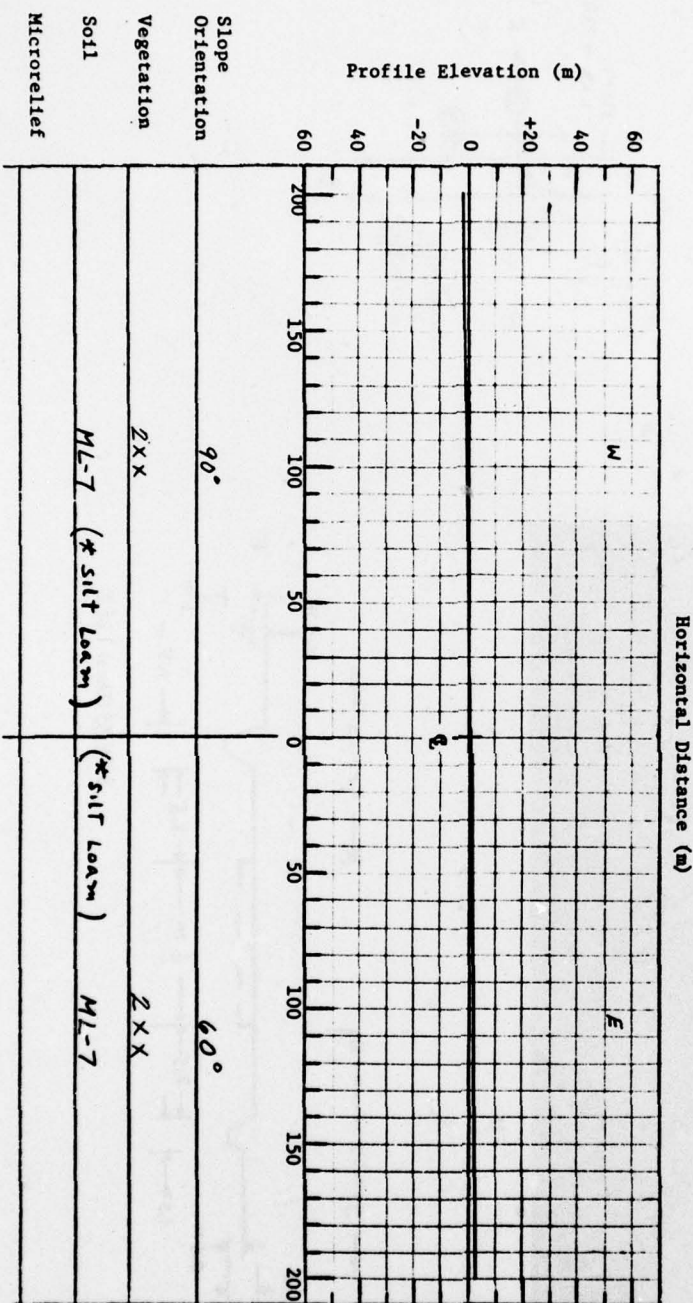


Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
* 6	Asphalt				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.

\* From field observation Aug 1974



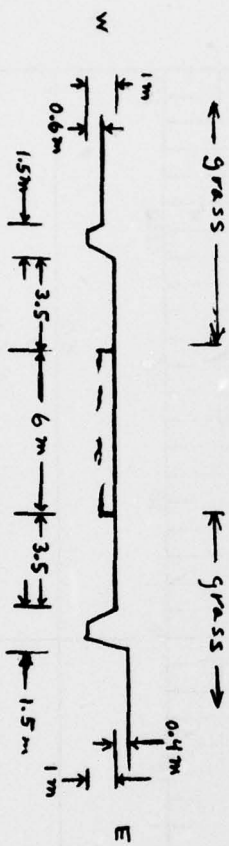
SITE 55 - PROFILE DATA

A79

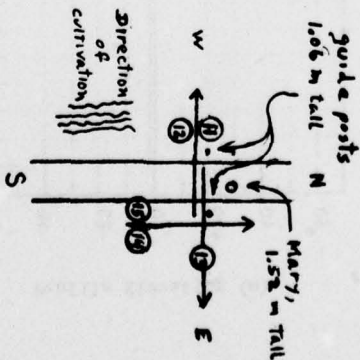


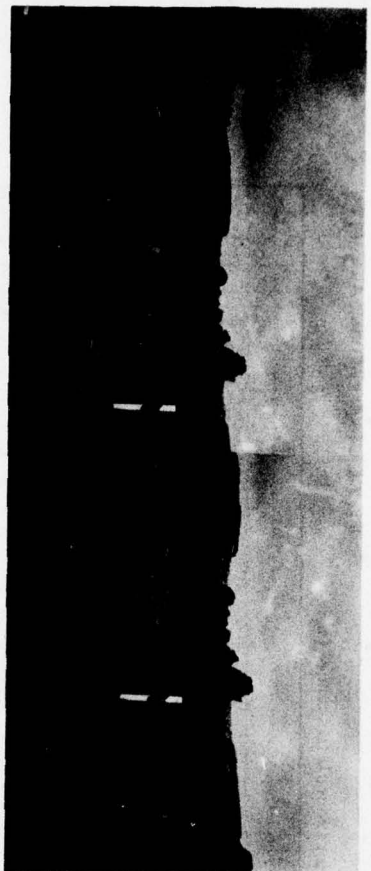
15

14



SITE 55 (Sheet 1 of 2)

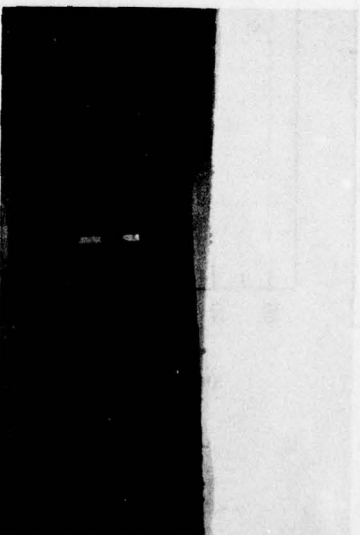




12

11

SITE 55 (Sheet 2 of 2)



13

A81



Sample Number: 56

Date: 6 Sept 74

Map Number: L5518

Scale: 1:50000

Coordinate Location:

Geographic: 50°34'48"N UTM Ref.: 08°56'07"E

Landscape: Cultivated

Valley bottom

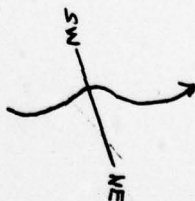
Direction: NW

Site Type: 4

Construction:

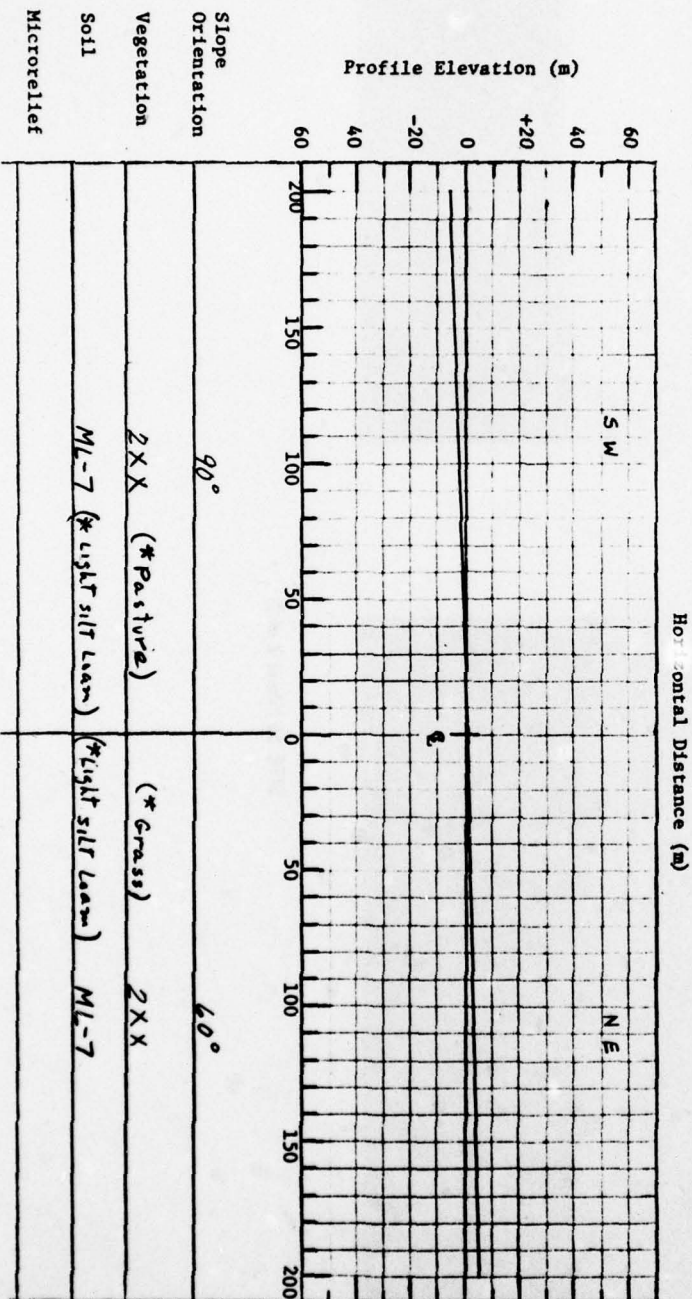
Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
* 6	Base	Asphalt			
	Subbase				

Notes and Comments:

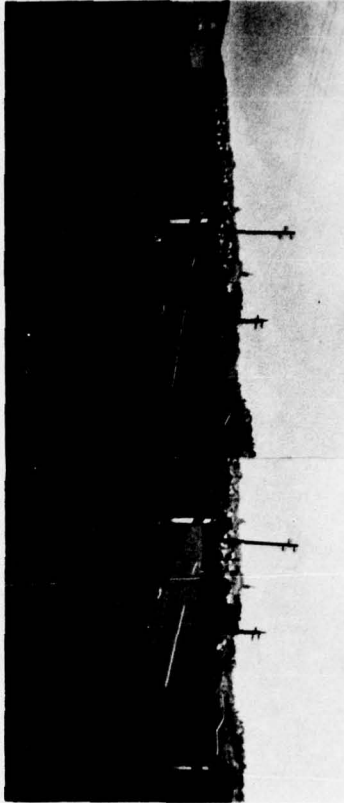


Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.

\* Field observation Aug 1974

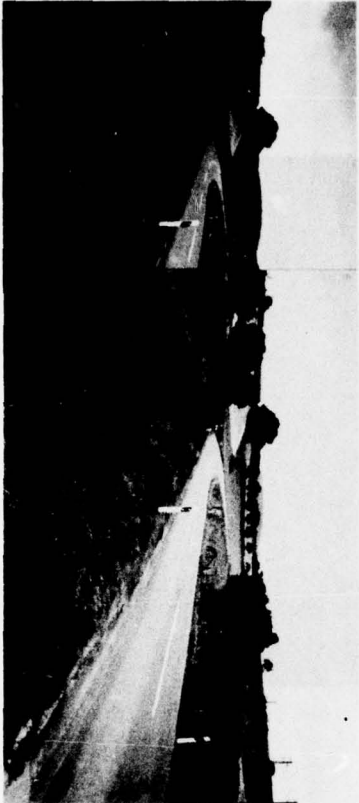


SITE 56 - PROFILE DATA



1

2

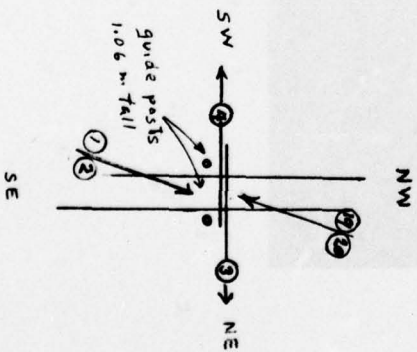
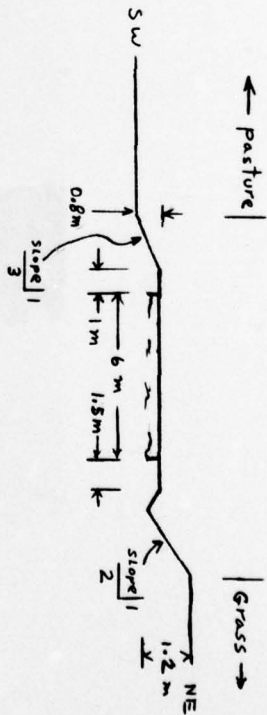


20

19

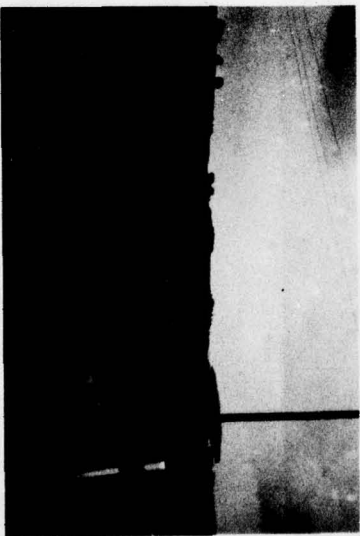
SITE 56 (Sheet 1 of 2)

A83





4



3

SITE 56 (Sheet 2 of 2)

Sample Number: 57

Date: 6 Sept 74

Map Number: 5421

Scale: 1:25000

Coordinate Location:

Geographic: 50°33'00"N UTM Ref.:  
09°15'08"E

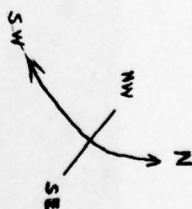
Landscape: Marshy and  
forested lowland

Road: Class: 4

Direction: NE

Site Type: 4

Notes and Comments:

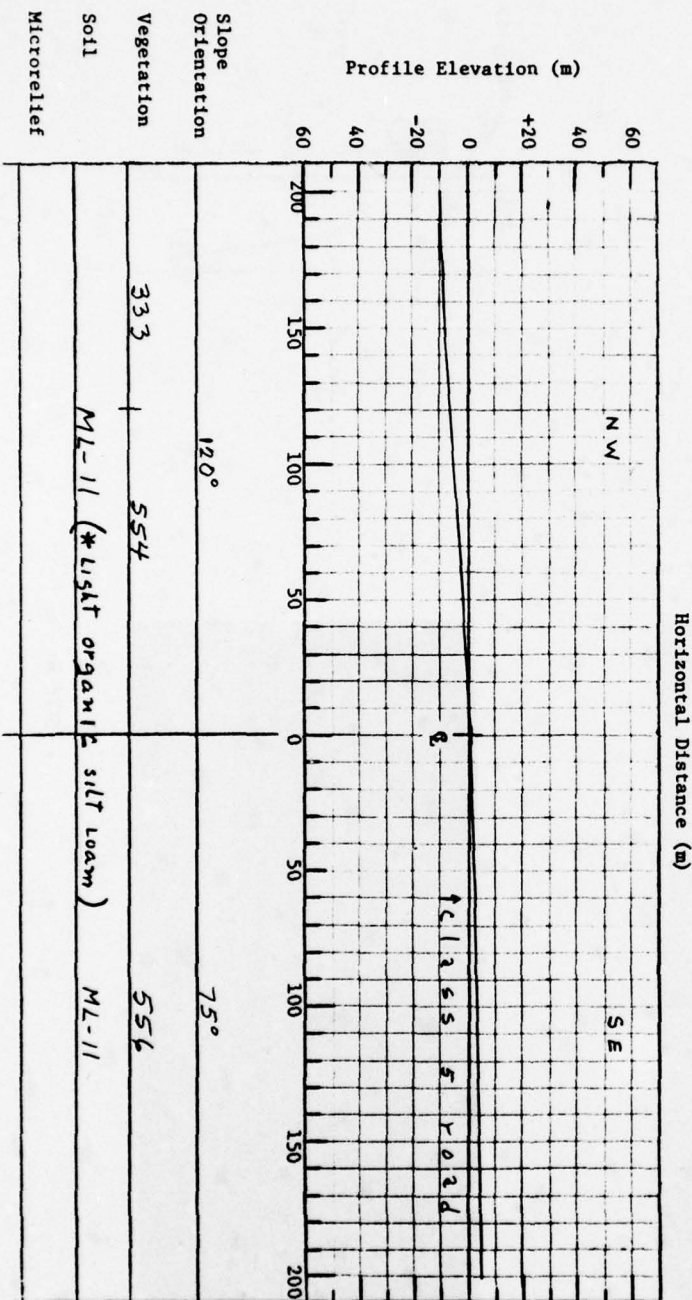


Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
* 2.5	Base	Metallized			
	Subbase				

Instruction: On transect profile sketch show  
location of important features,  
such as stream crossings, ditches,  
etc.

\* from field observation, Aug 1974



SITE 57 - PROFILE DATA

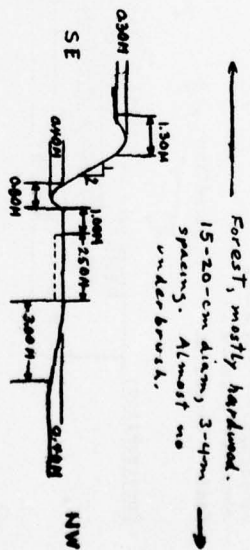
A85





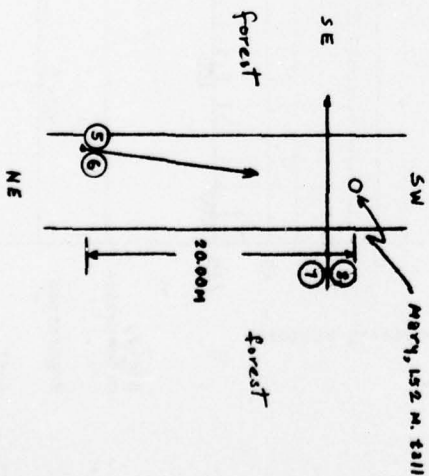
5

6



7

8



SITE 57

A86

Sample Number: 58

Date: 6 Sept 74

Map Number: 5421

Scale: 1:25000

Coordinate Location:

Geographic: 50°33'00" N UTM Ref.:

Landscape: forested hill

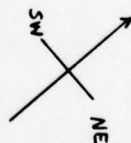
09°15'32"E

Road: Class: 5

Direction: NW

Site Type: 4

Notes and Comments:

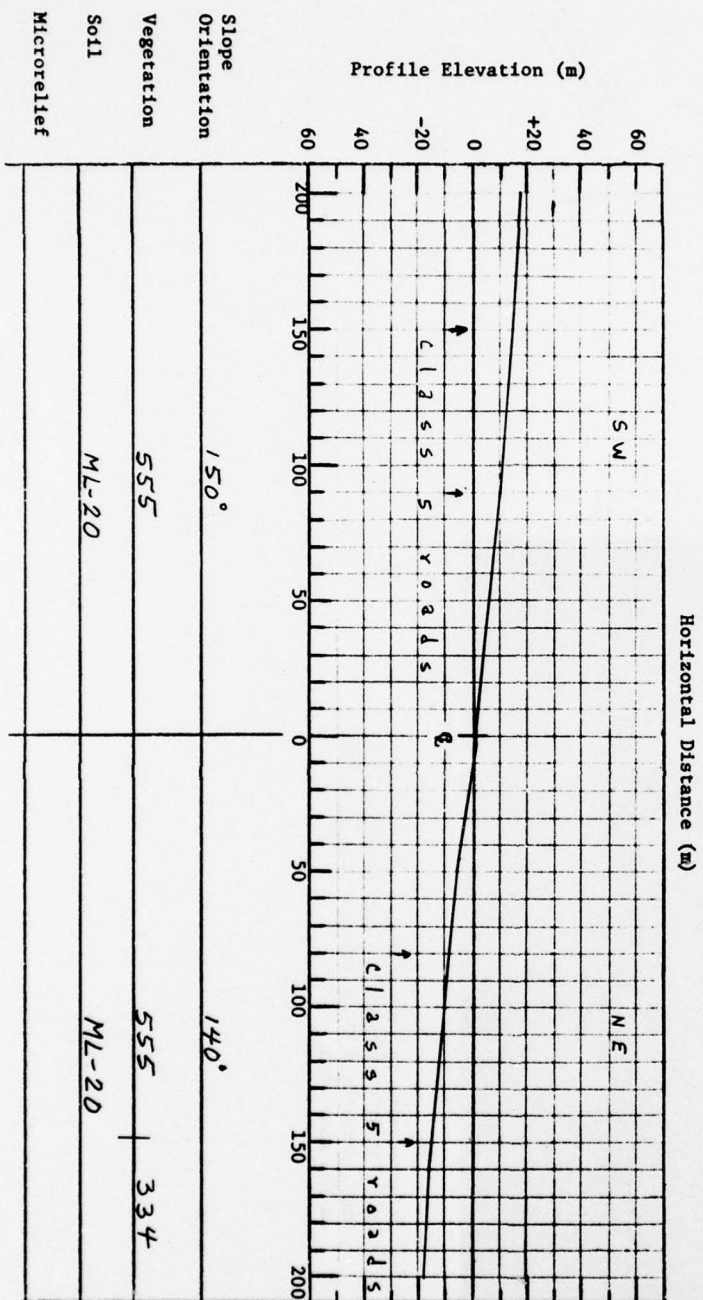


Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction:

On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



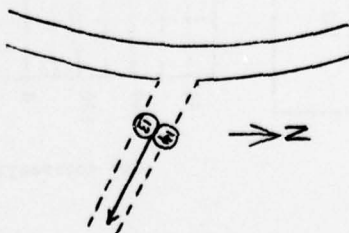
SITE 58 - PROFILE DATA

A87



Selected site is inaccessible. Photographs are at 50°33'11"N, 9°15'50"E (UTMG coordinates 180 019), some 500 m NW of the selected site but on the same road.

SITE 58



Date: 6 Sept 74

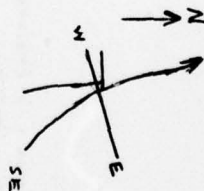
Scale: 1:25000

Geographic: 50° 33' 00" N UTM Ref.:

Direction: NW

Site Type: 4

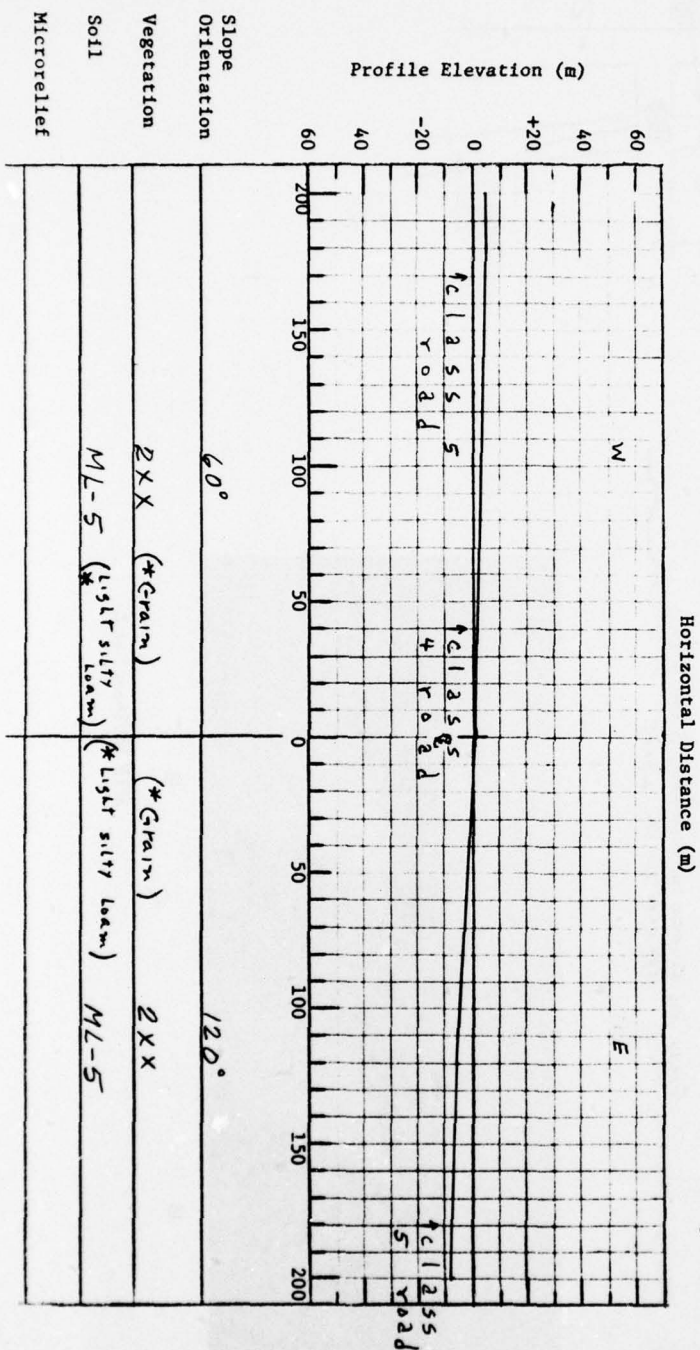
Notes and Comments:



**Instruction:** On transect profile sketch show location of important features, such as stream crossings, ditches, etc.

\* field observation, Aug 1974

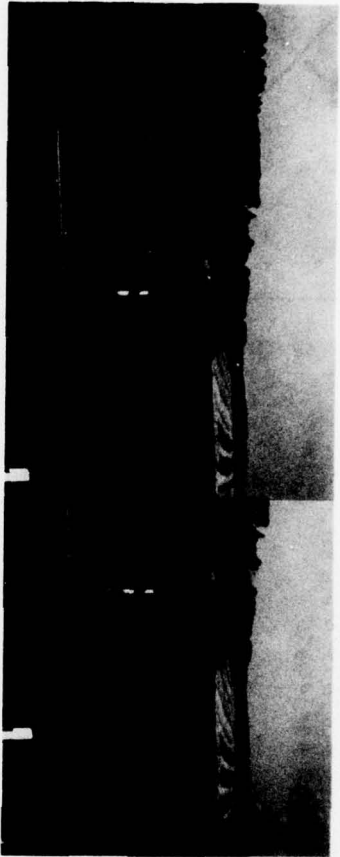
Construction:		Traffic Surface		Shoulder	
Width (m)  * 6	Surface *	Material	Thick (cm)	Width (m)	Material
	Base	Blacktop			
	Subbase				



SITE 59 - PROFILE DATA

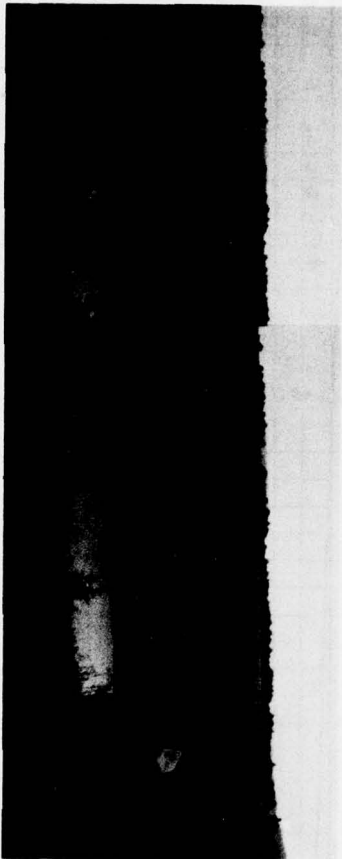






12

11



14

13

SITE 59 (Sheet 2 of 2)

A91

Sample Number: 60

Date: 6 Sept 74

Map Number: 5421

Scale: 1:25000

**Coordinate Location:**

Geographic: 50°33'14"N UTM Ref.:  
09°19'15"E

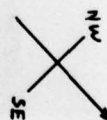
Landscape: Pasture  
and forested hill side

Road: Class: 3

**Direction:** *NE*

Site Type: 4

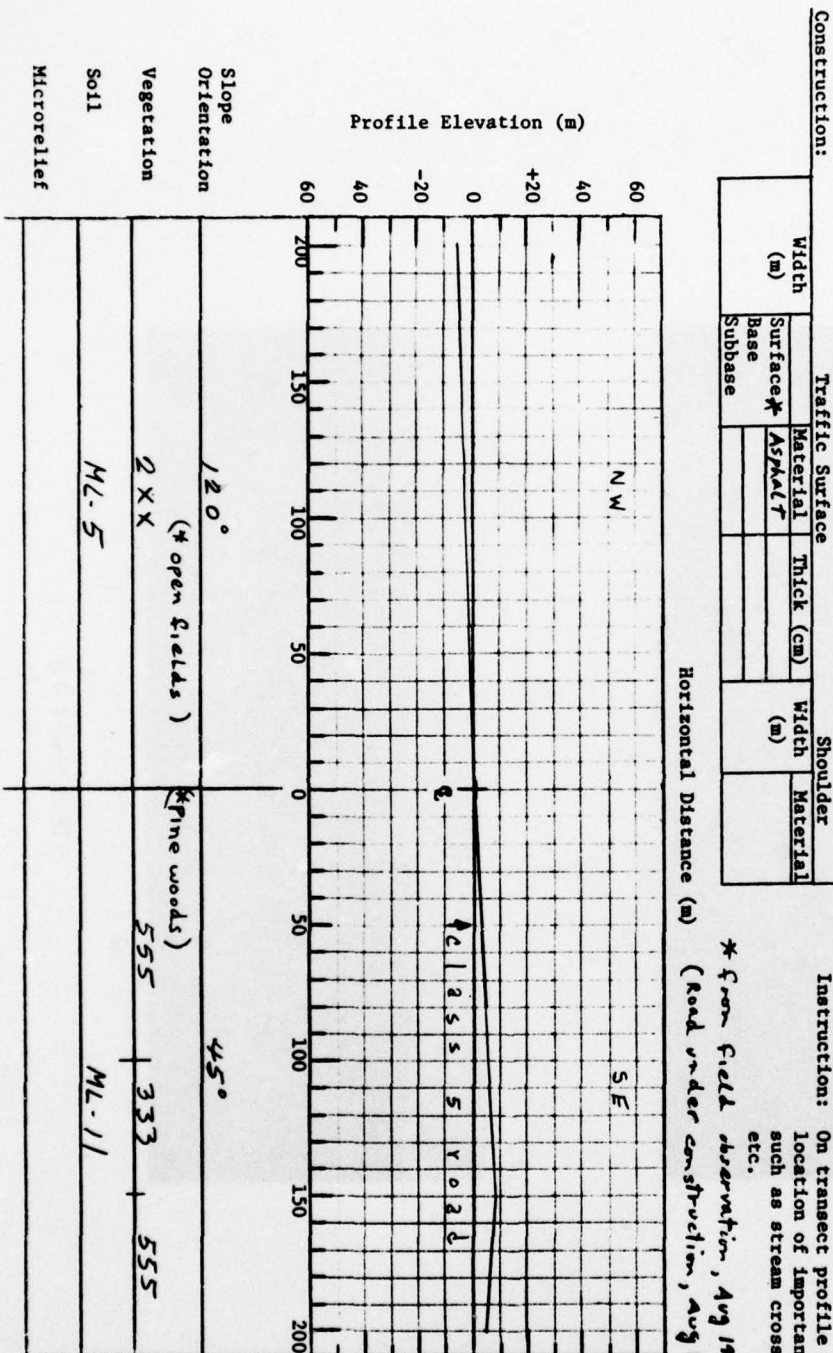
**Notes and Comments:**



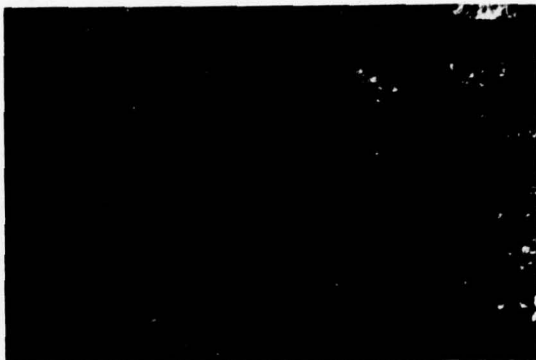
**Instruction:** On transect profile sketch show

location of important features,  
such as stream crossings, ditches,  
etc.

\* from field observation, Aug 1974  
(Road under construction, Aug 1974)



SITE 60 - PROFILE DATA



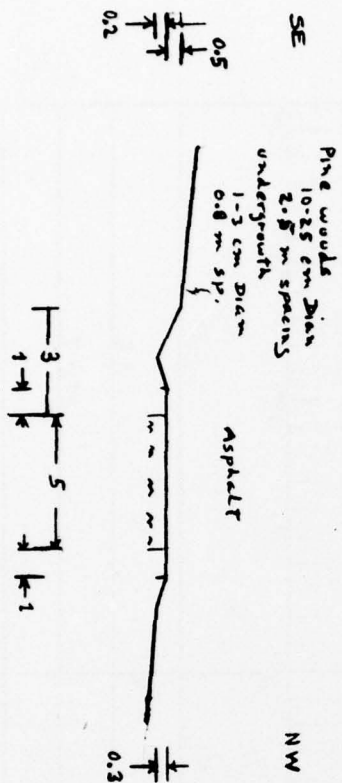
18



19

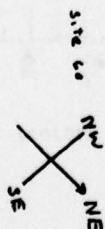
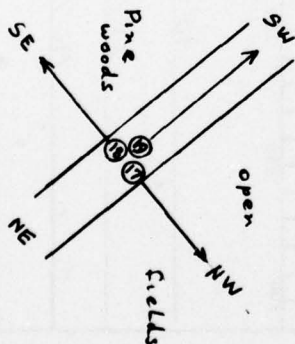


17



SITE 60

A93





Sample Number: 61

Date: 7 Sept 74

Notes and Comments:

Map Number: 5423

Scale: 1:25000

Coordinate Location:

Geographic: 50°33'05"N UTM Ref.:  
09°35'00"E

Landscape: Cultivated  
hills side

Road: Class: 5

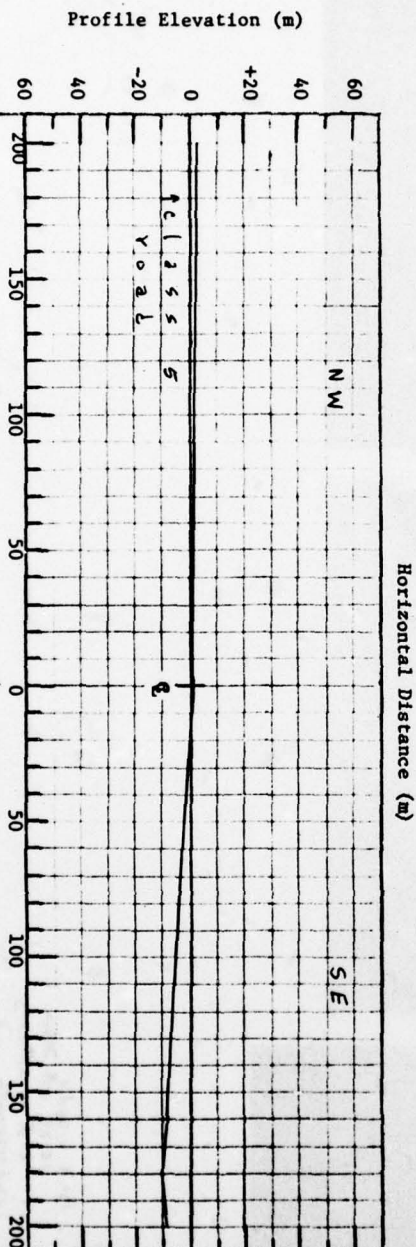
Direction: NE

Site Type: 4

Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



Slope  
Orientation

Vegetation

Soil

Microrelief

SITE 61 - PROFILE DATA

A94

Sample Number: 62

Date: 7 Sept 74

Map Number: 5423

Scale: 1:25000

Coordinate Location:

Geographic: 50°35'42"N UTM Ref.:  
09°35'00"E

Landscape: Forested pasture  
400' cultivated hillside

Road: Class: 3

Direction: E

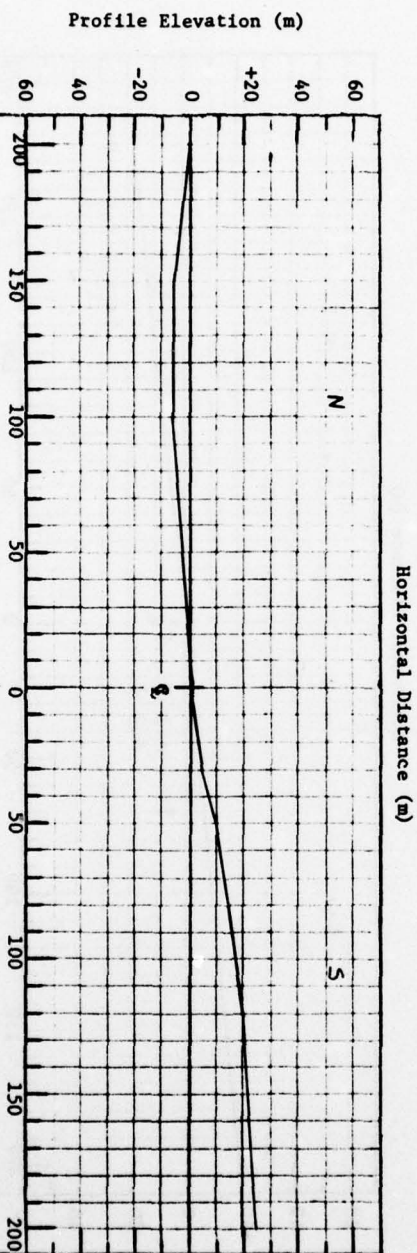
Site Type: 3/2

Notes and Comments:



Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				



Slope Orientation

Vegetation

Soil

Microrelief

90°	120°	30°
5XX	2XX	2XX
ML-12	ML-3	ML-3

SITE 62 - PROFILE DATA

A95

Sample Number: 63

Date: 7 Sept 74

Notes and Comments:

Map Number: 5425

Scale: 1:25000

Coordinate Location:

Geographic: 50°33'00"N UTM Ref.:

Landscape: Forest  
4/11/3/de

09°55'00"E

Road: Class: 4

Direction: NW

Site Type: 4

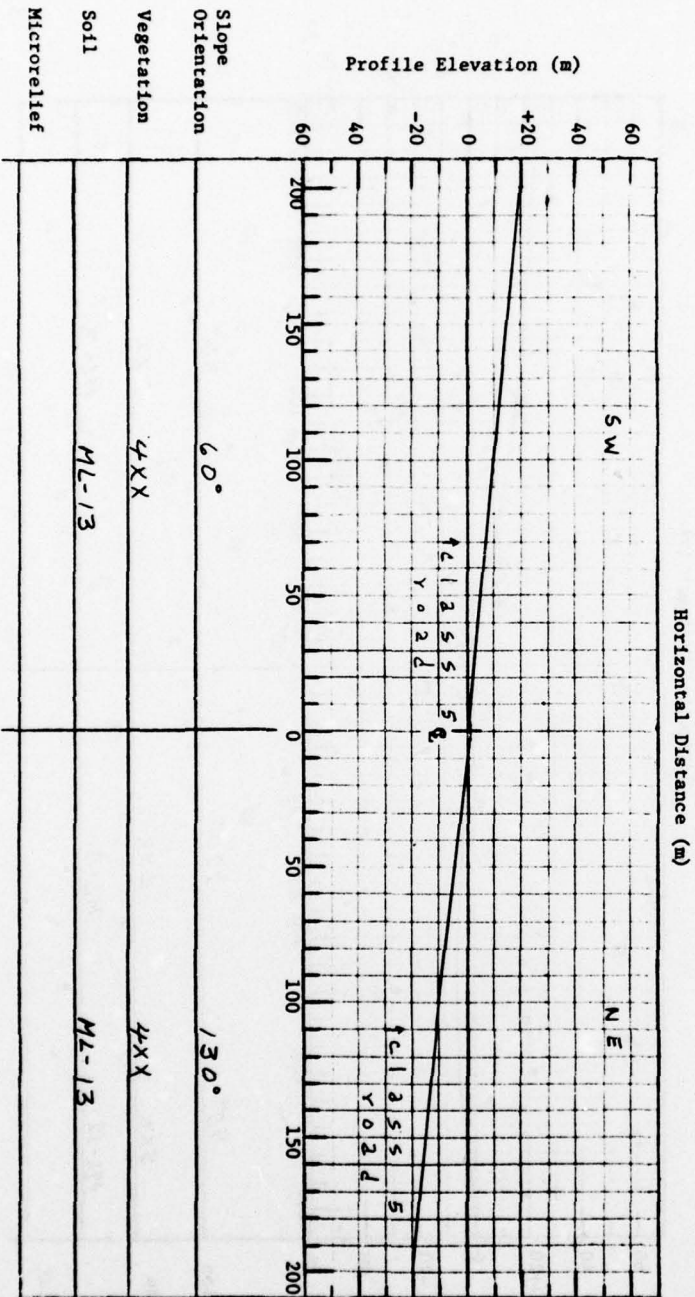


Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction: On transect profile sketch show

location of important features,  
such as stream crossings, ditches,  
etc.



SITE 63 - PROFILE DATA



Sample Number: 64

Date: 7 Sept 74

Notes and Comments:

Map Number: 5425

Scale: 1:25000

Coordinate Location:

Geographic: 50°33'20" UTM Ref.:

Landscape: Forested

09°55'28"

Road: Class: 5

Direction: NE

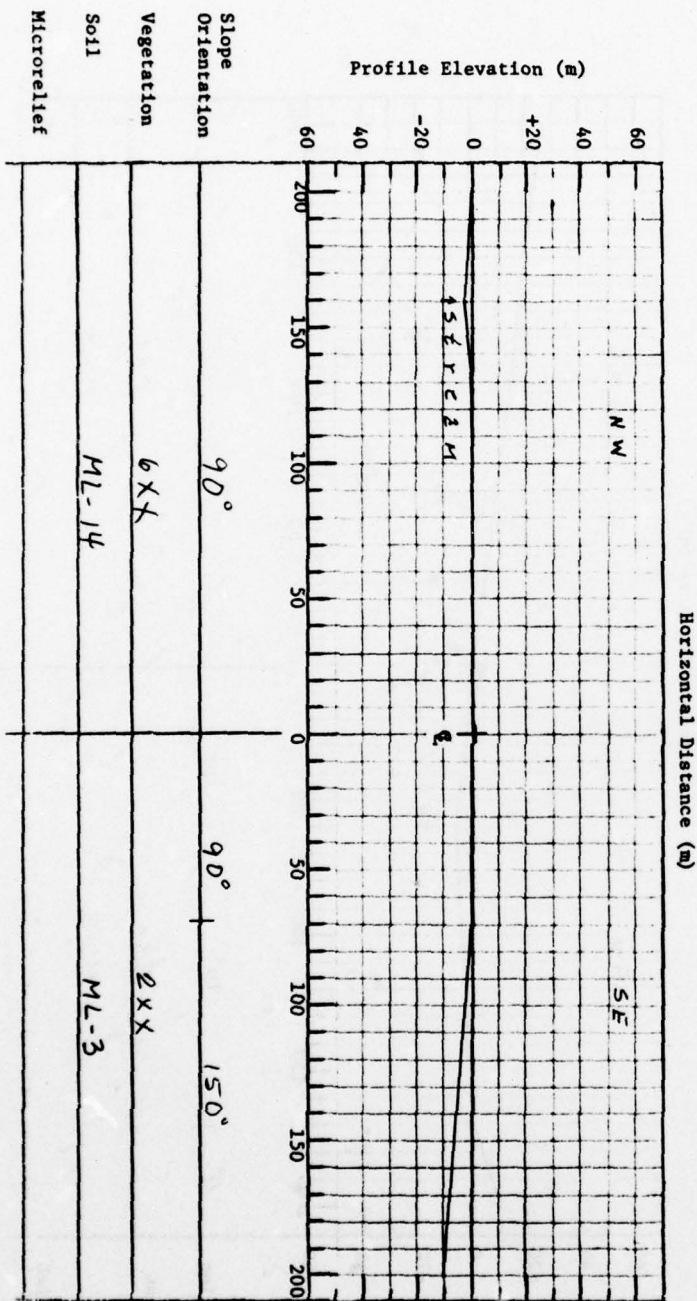
Site Type: 1/4

Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction:

On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



SITE 64 - PROFILE DATA



Sample Number: 65

Date: 9 Sept 74

Notes and Comments:

Map Number: 5425

Scale: 1:25000

Coordinate Location:

Geographic: 50°33'34"N UTM Ref.: 09°54'04"E

Landscape: Pasture valley  
between wooded hillsides

Road: Class: 3

Direction: NW

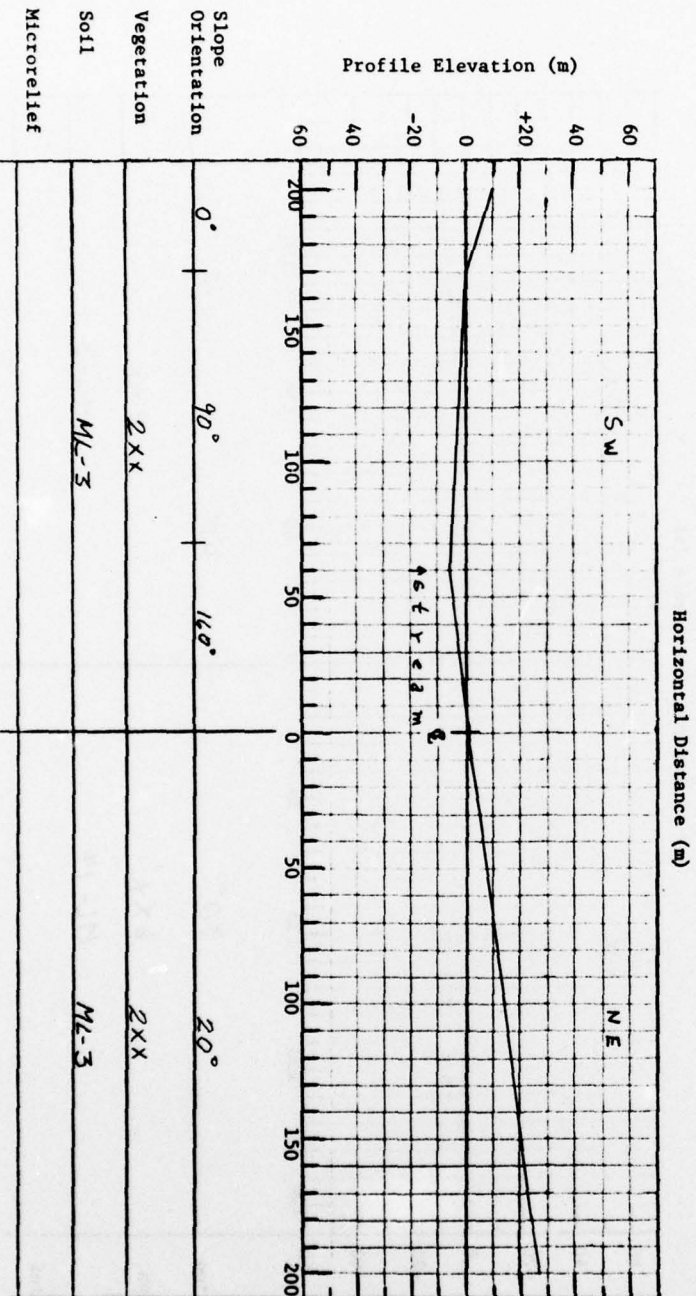
Site Type: 3



Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width	Material
	Base				
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream cross-ings, ditches, etc.



SITE 65 - PROFILE DATA

A98

Sample Number: 66

Date: 9 Sept 74

Notes and Comments:

Map Number: 5425

Scale: 1:25000

Coordinate Location:

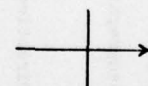
Geographic: 50°35'33"N UTM Ref.: 09°59'13"E

Landscape: Pasture Valley  
bottom and forested hill side

Road: Class: 2

Direction: N

Site Type: 3

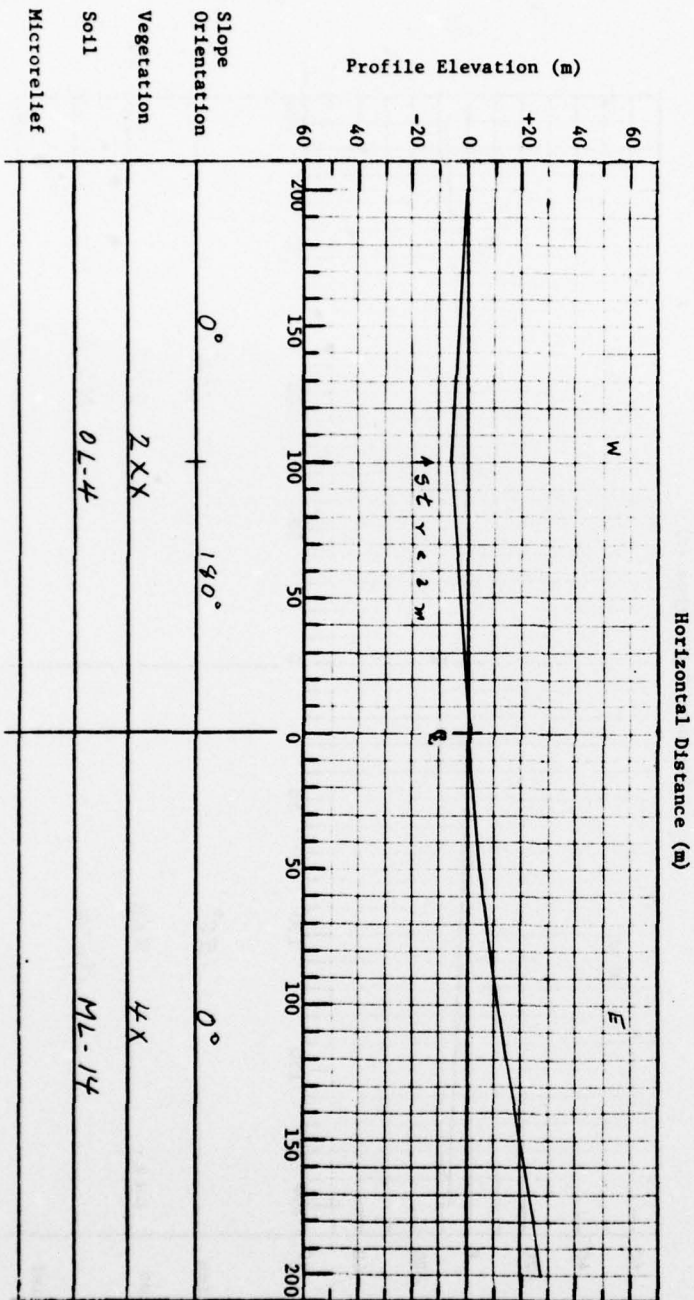


Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction:

On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



SITE 66 - PROFILE DATA

A99

Sample Number: 67

Date: 9 Sept 74

Notes and Comments:

Map Number: L5714

Scale: 1:50000

Coordinate Location:

Geographic: 50°21'09"N UTM Ref.:

Landscape: Forested and

08°15'00"E

Road: Class: 3

Direction: NE

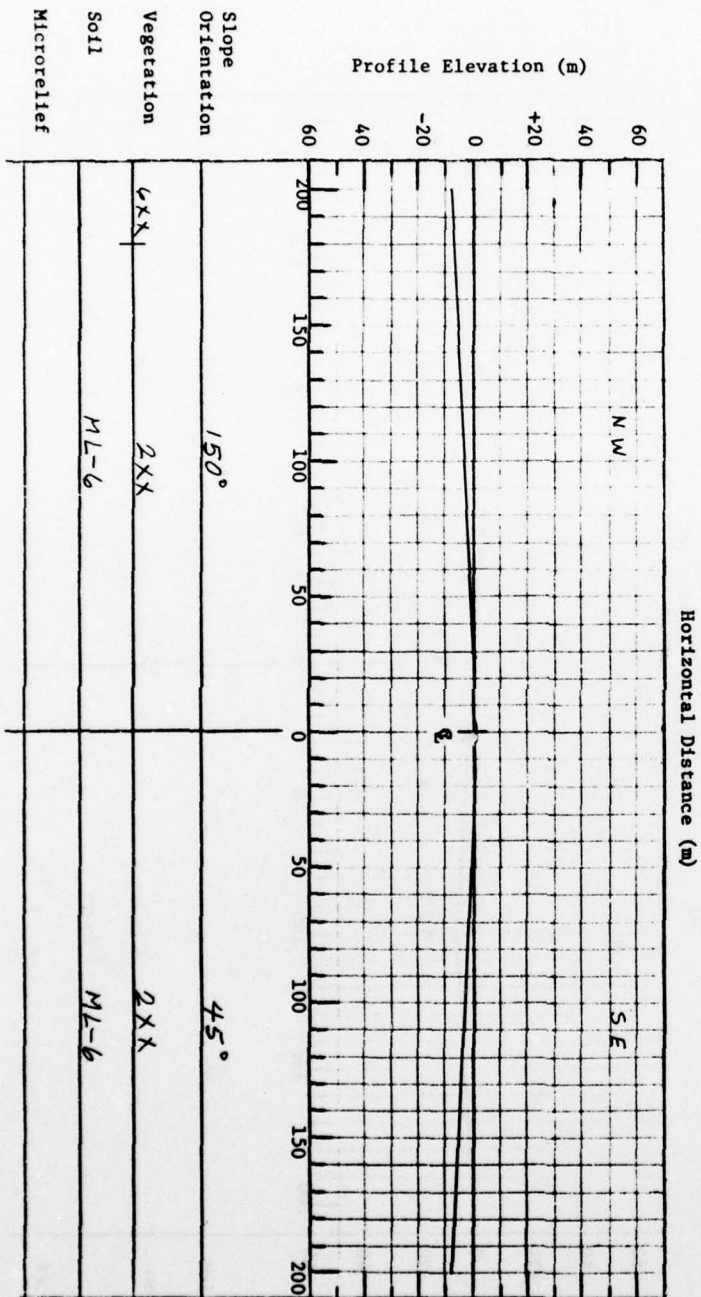
Site Type: 2



Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



SITE 67 - PROFILE DATA  
A100



Sample Number: 68

Date: 9 Sept 74

Notes and Comments:

Map Number: 257/4

Scale: 1:50000

Coordinate Location:

Geographic: 50°21'42"N UTM Ref.: 08°15'00"E

Landscape: forested and cultivated valley

Road: Class: 5

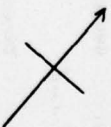
Direction: NW

Site Type: 3

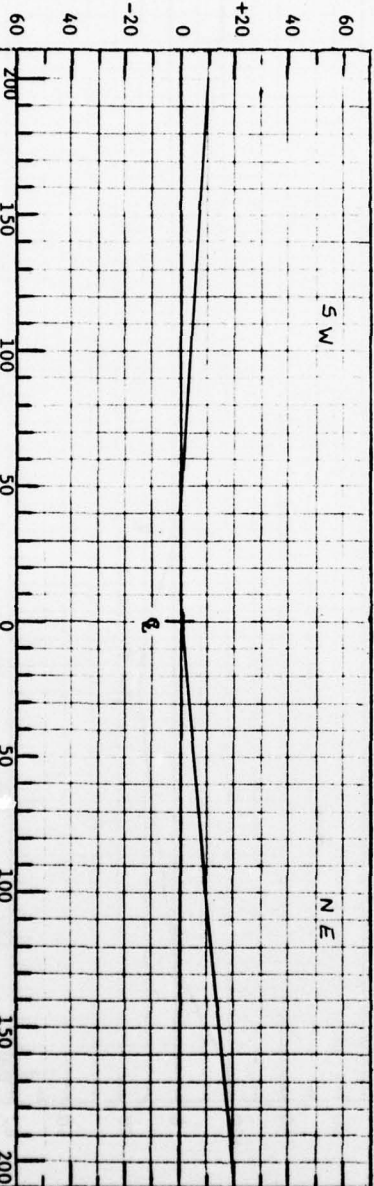
Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



Profile Elevation (m)



Slope  
Orientation  
Vegetation  
Soil  
Microrelief

SITE 68 - PROFILE DATA

A101



Sample Number: 69

Date: 9 Sept 74

Notes and Comments:

Map Number: L5714

Scale: 1:50000

Coordinate Location:

Geographic: 50°22'30"N UTM Ref.:

Landscape: forested and

cultivated valley

Road: Class: 2

Direction: NW

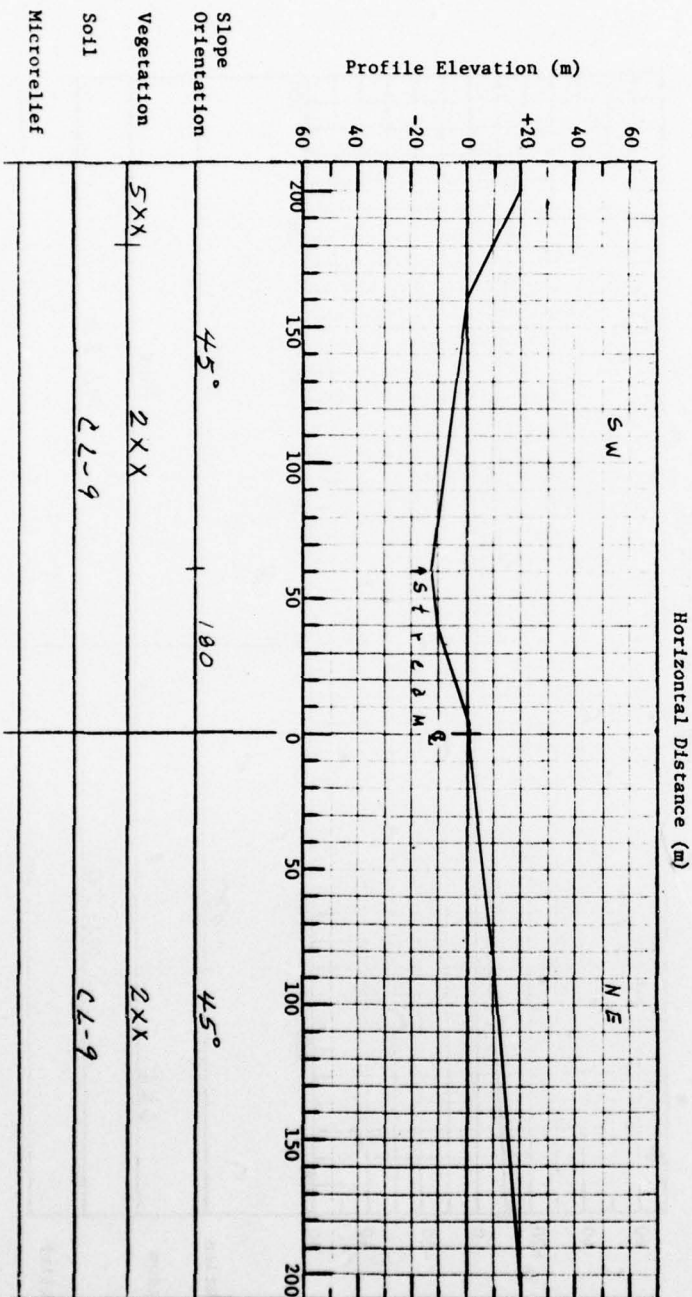
Site Type: 3



Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



SITE 69 - PROFILE DATA

A102

Sample Number: 70

Date: 9 Sept 74

Notes and Comments:

Map Number: L5716

Scale: 1:50000

Coordinate Location:

Geographic: 50°21'00"N UTM Ref.:

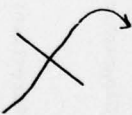
Landscape: Forested and  
cultivated valley

08°35'21"E

Road: Class: 3

Direction: NW

Site Type: 3

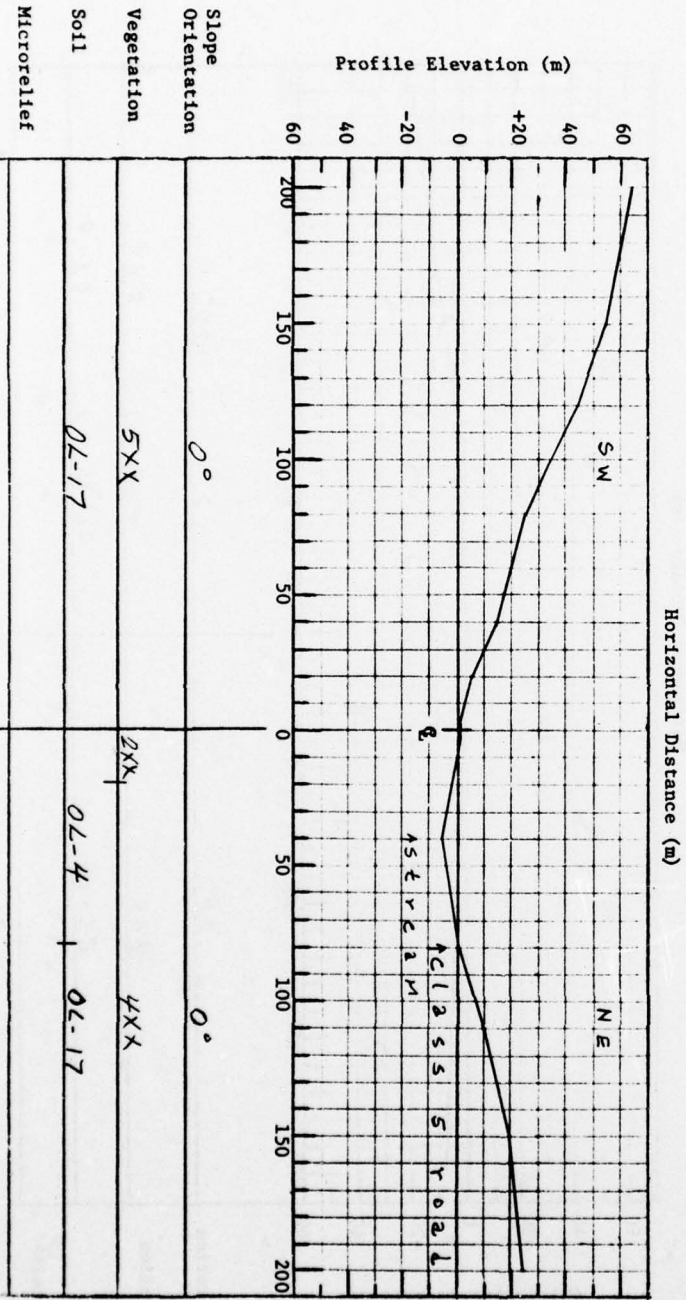


Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction:

On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



SITE 70 - PROFILE DATA

A103

Sample Number: 71

Date: 9 Sept 74

Notes and Comments:

Map Number: L5716

Scale: 1:50000

Coordinate Location:

Geographic: 50°21'00"N UTM Ref.:

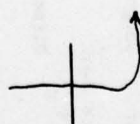
Landscape: Forested and

08°35'55"E

Road: Class: 5

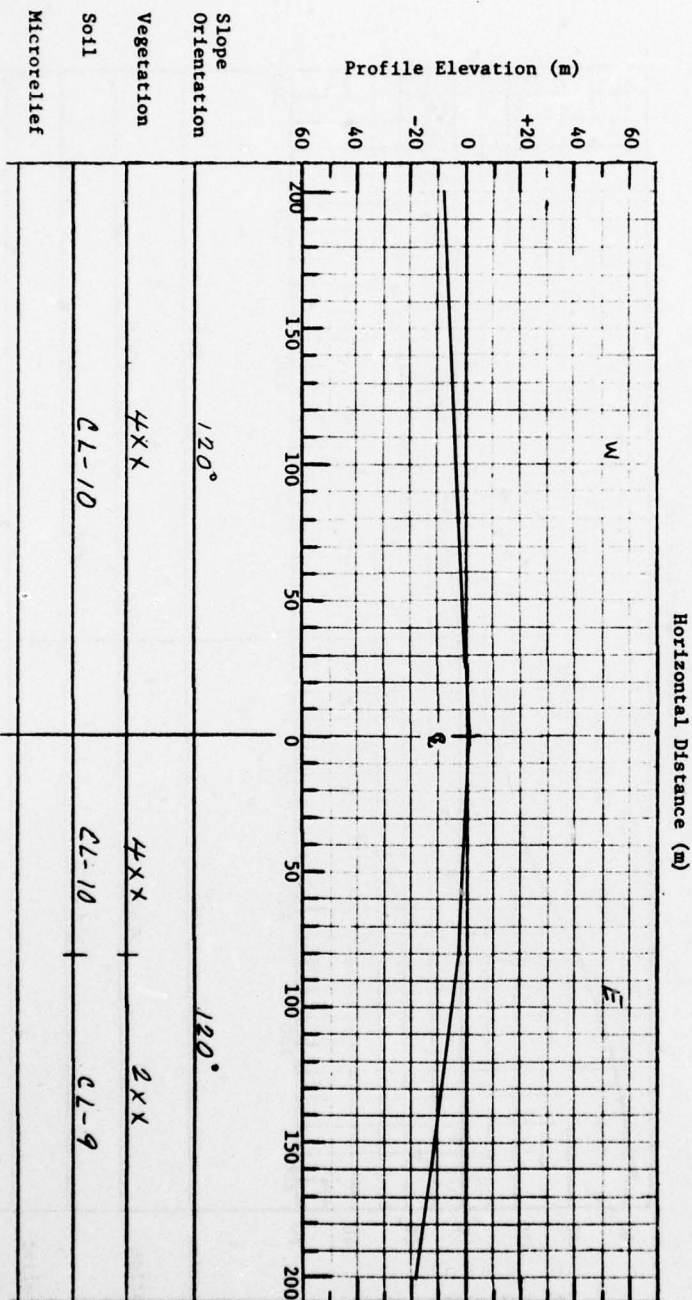
Direction: N

Site Type: 2



Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.

Construction:	Width (m)	Traffic Surface			Shoulder	
		Surface	Material	Thick (cm)	Width (m)	Material
		Base				
		Subbase				



SITE 71 - PROFILE DATA

A104



Sample Number: 72

Date: 9 Sept 74

Map Number: 5619

Scale: 1:25000

Coordinate Location:

Geographic: 50°21'17"N UTM Ref.:  
08°55'00"E

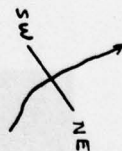
Landscape: Forested upland

Road: Class: 5

Direction: NW

Site Type: 2

Notes and Comments:

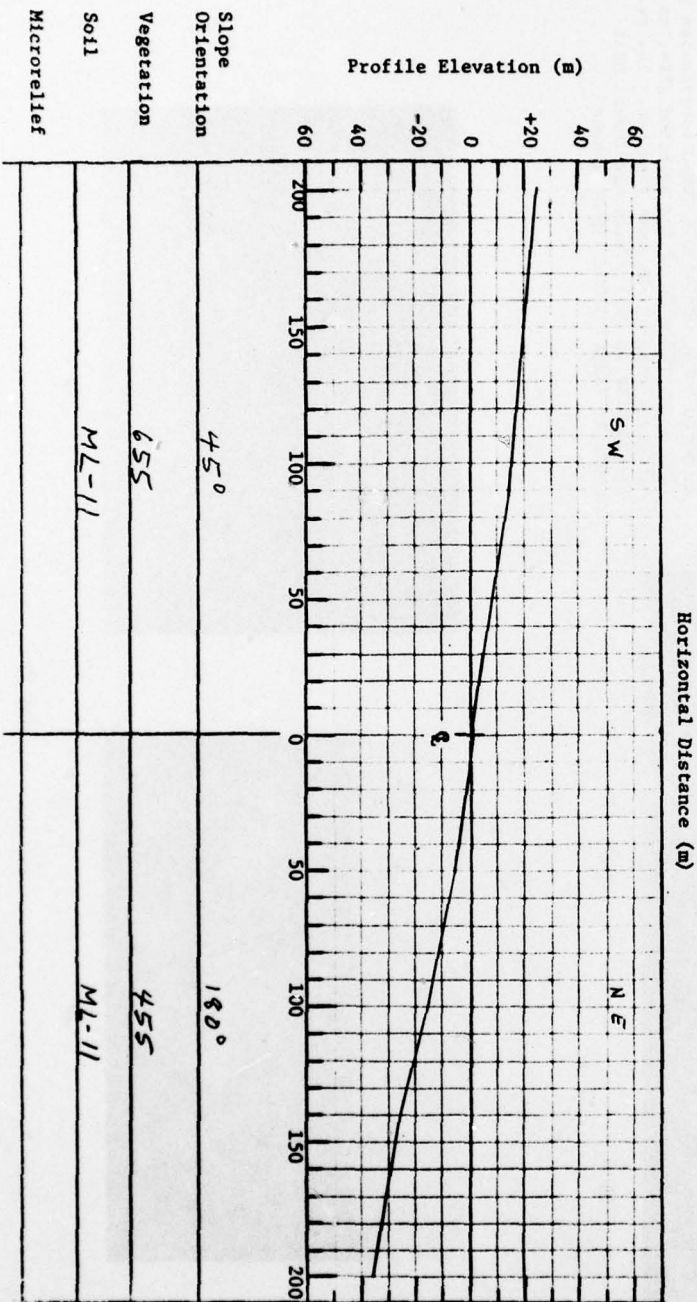


Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction:

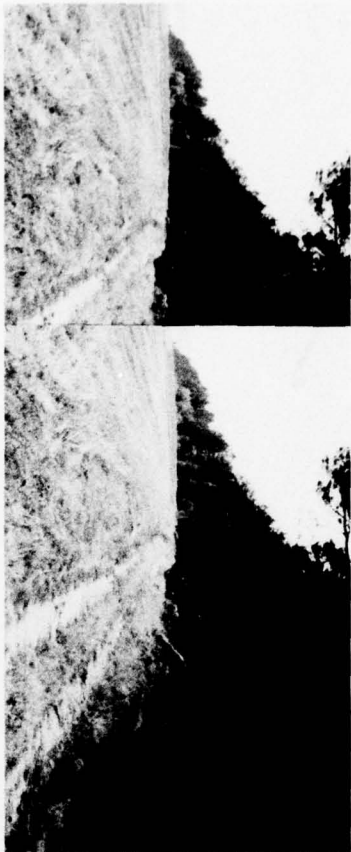
On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



SITE 72 - PROFILE DATA

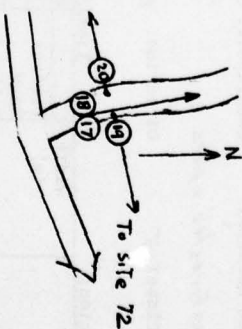
A105



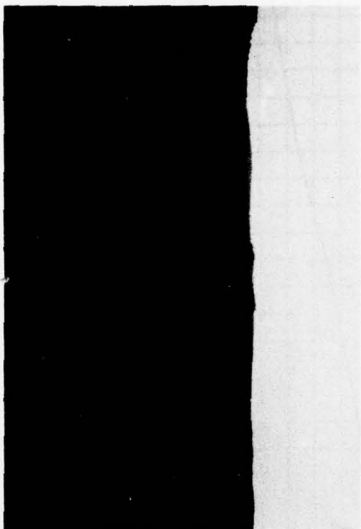


18

17



Selected site is inaccessible. Photographs are at 50°20'50"N, 08°54'30"E (UMC coordinates 936 789) about 700 m SW of the selected site, on a different road of the same road net. The selected site is well within the forest unit shown at right in these photographs.



20



19

SITE 72

A106

Sample Number: 73

Date: 9 Sept 74

Map Number: 5619

Scale: 1:25000

Coordinate Location:

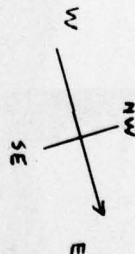
Geographic: 50°21'44"N UTM Ref.: 08°55'00"E

Landscape: Cultivated  
and forested upland

Direction: NE

Site Type: 1/4

Notes and Comments:



Construction:

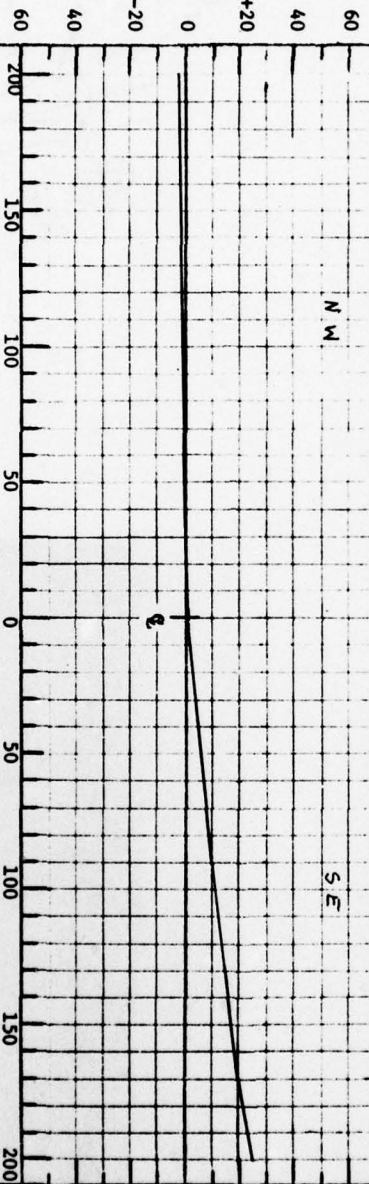
Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
* 5	Base	Blacktop			
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.

Horizontal Distance (m)

\* From field observation, Aug 1974

Profile Elevation (m)



Slope  
Orientation

90°

45°

Vegetation

2x4

454

Soil

ML-5 (\*Clay loam)

(\*Clay loam) ML-11

Microrelief

SITE 73 - PROFILE DATA

A107



18

17

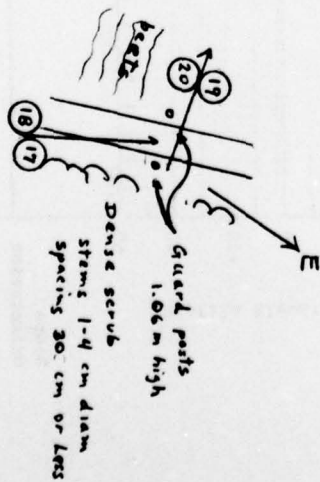
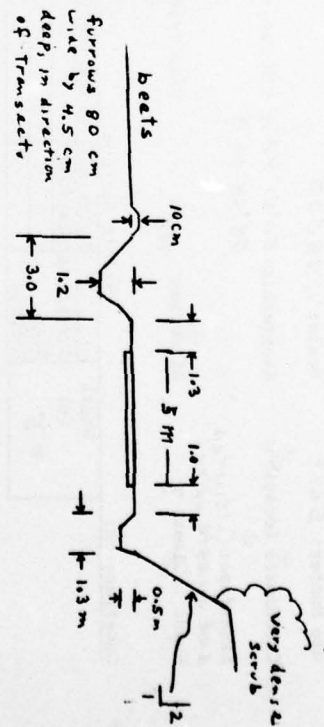


20

19

SITE 73

A108



Sample Number: 74

Date: 9 Sept 74

Map Number: 5619

Scale: 1:25000

Coordinate Location:

Geographic: 50°22'34"N UTM Ref.: 08°55'00"E

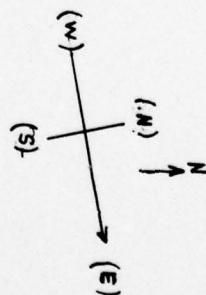
Landscape: (4) Hatched upland

Road: Class: 4

Direction: NE

Site Type: 4

Notes and Comments:

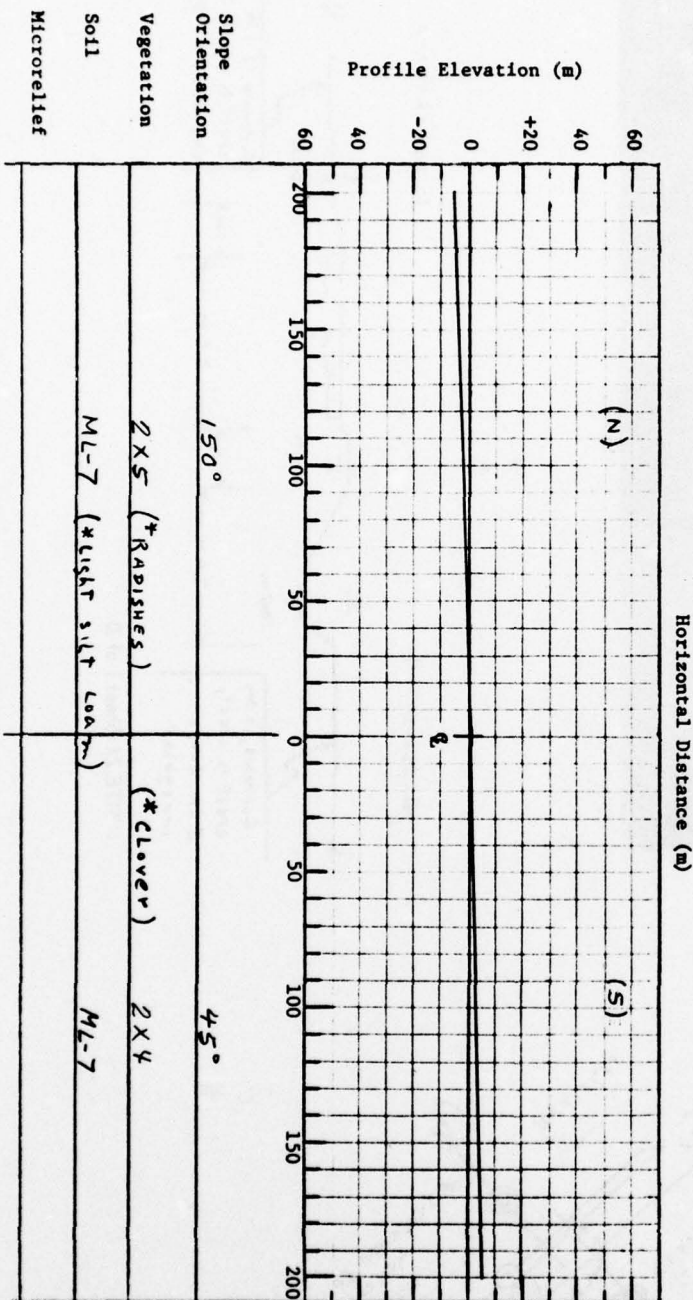


Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
* 3	Base	Concrete			
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.

\* field observation, Aug 1973

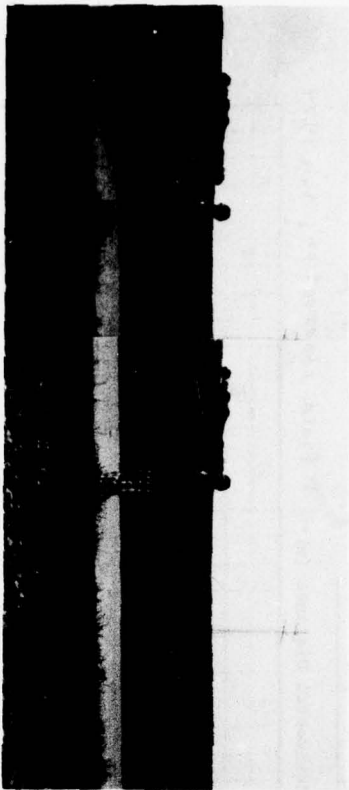


SITE 74 - PROFILE DATA

A109



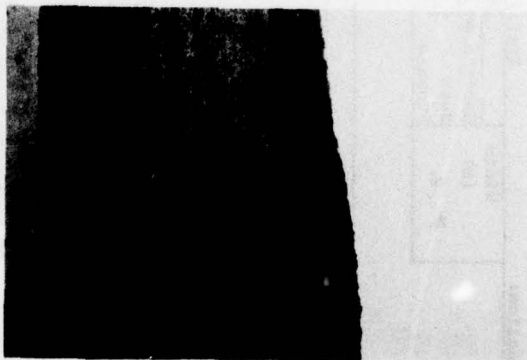




4

3

SITE 74 (Sheet 2 of 2)



5

ALL

Sample Number: 75

Date: 9 Sept 74

Notes and Comments:

Map Number: 5621

Scale: 1:25000

Coordinate Location:

Geographic: 50°21'02" N UTM Ref.:

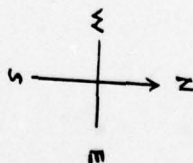
Landscape: Cultivated hill

09°15'03" E

Road: Class: 5

Direction: N

Site Type: 2



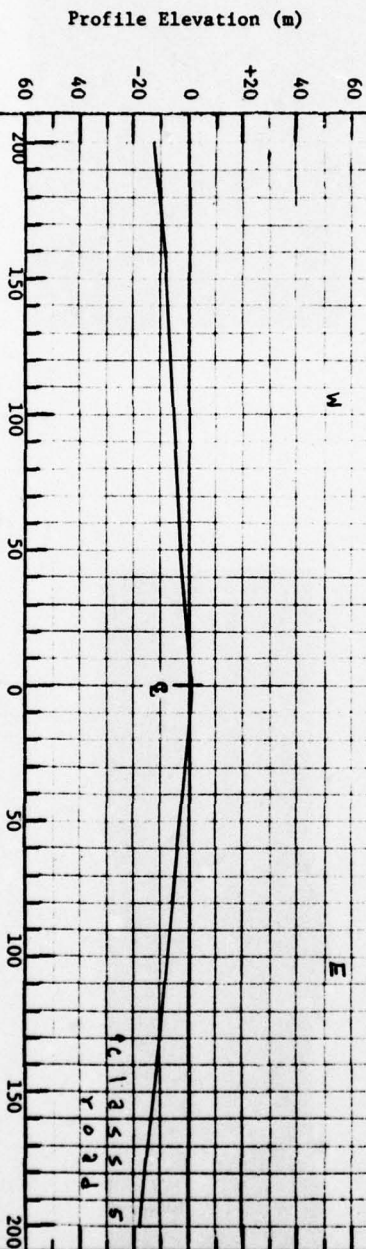
Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
* 2	Base	Soil			
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.

Horizontal Distance (m)

\* Field observation, Aug 1974



Slope  
Orientation

Vegetation

Soil

Microrelief

135°

2XX (\* Tomatoes )

(\* Plowed )

2XX

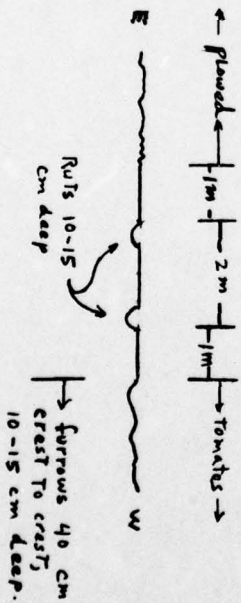
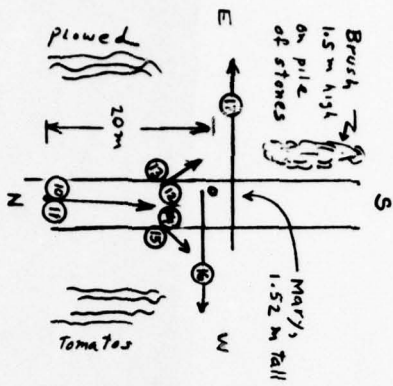
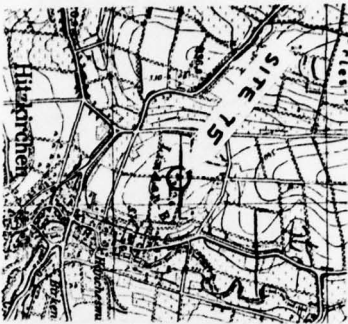
M-L-6 (\* clay loam)

(\* clay loam)

M-L-6

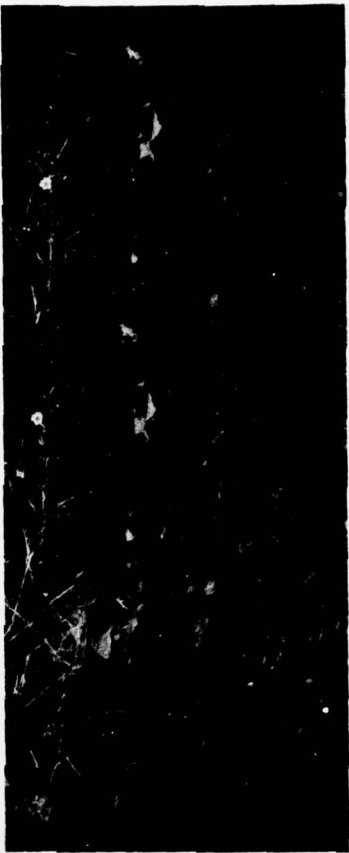
SITE 75 - PROFILE DATA

A112



SITE 75 (Sheet 1 of 2)





13

12

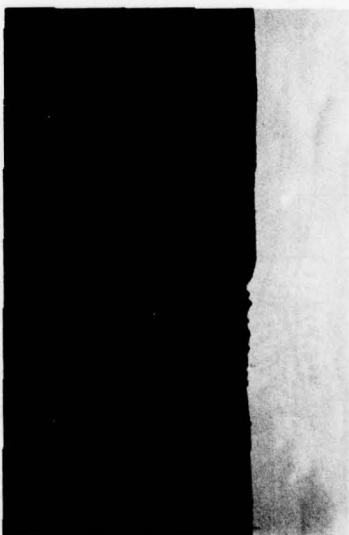


14

15

SITE 75 (Sheet 2 of 2)

ALL



17



16

Sample Number: 76

Date: 9 Sept 74

Notes and Comments:

Map Number: 5621

Scale: 1:25000

Sources:

Map 1964

(1957 data)

Aerial photos 19 -

\* field observation

Aug 1974

ground photos Aug 1974.

Coordinate Location:

Geographic: 50°21'23"N UTM Ref.:

Landscape: Cultivated hillside

09°15'22"E

400 m above valley floor

Road: Class: 3

Direction: N

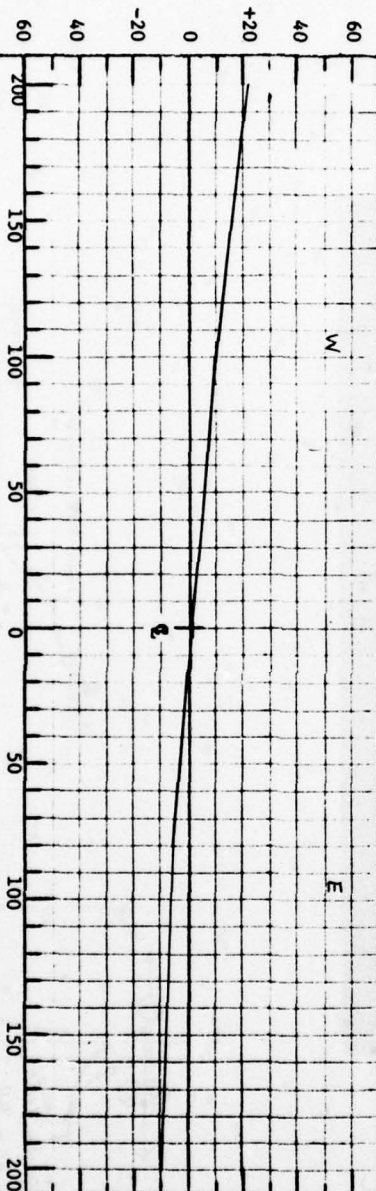
Site Type: 4

Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Base	Subbase	Material	Material
* 5.5				* Blacktop	

Horizontal Distance (m)

Profile Elevation (m)



Slope  
Orientation

0°

180°

Vegetation

2XX

2XX

Soil

ML-6 (\* silt loam)

(\* silt loam)

OL-4

Microrelief

SITE 76 - PROFILE DATA

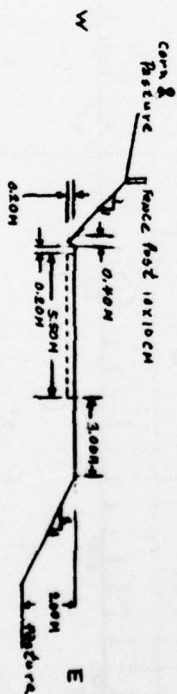
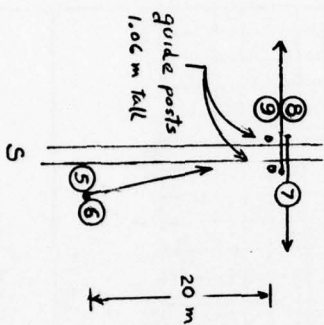
ALL5



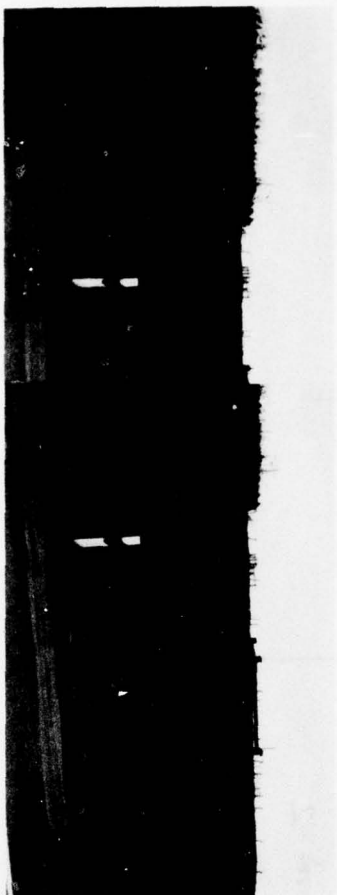


5

6

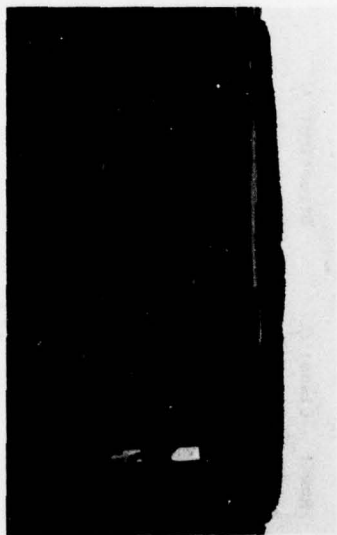


SITE 76 (Sheet 1 of 2)



9

8



7



SITE 76 (Sheet 2 of 2)

ALL7



Sample Number: 77

Date: 9 Sept 74

Notes and Comments:

Map Number: 5621

Scale: 1:25000

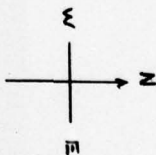
Coordinate Location: Geographic: 50°22'05" N UTM Ref.:

Landscape: Wooded upland 09°16'49" E

Road: Class: 4

Direction: N

Site Type: 2



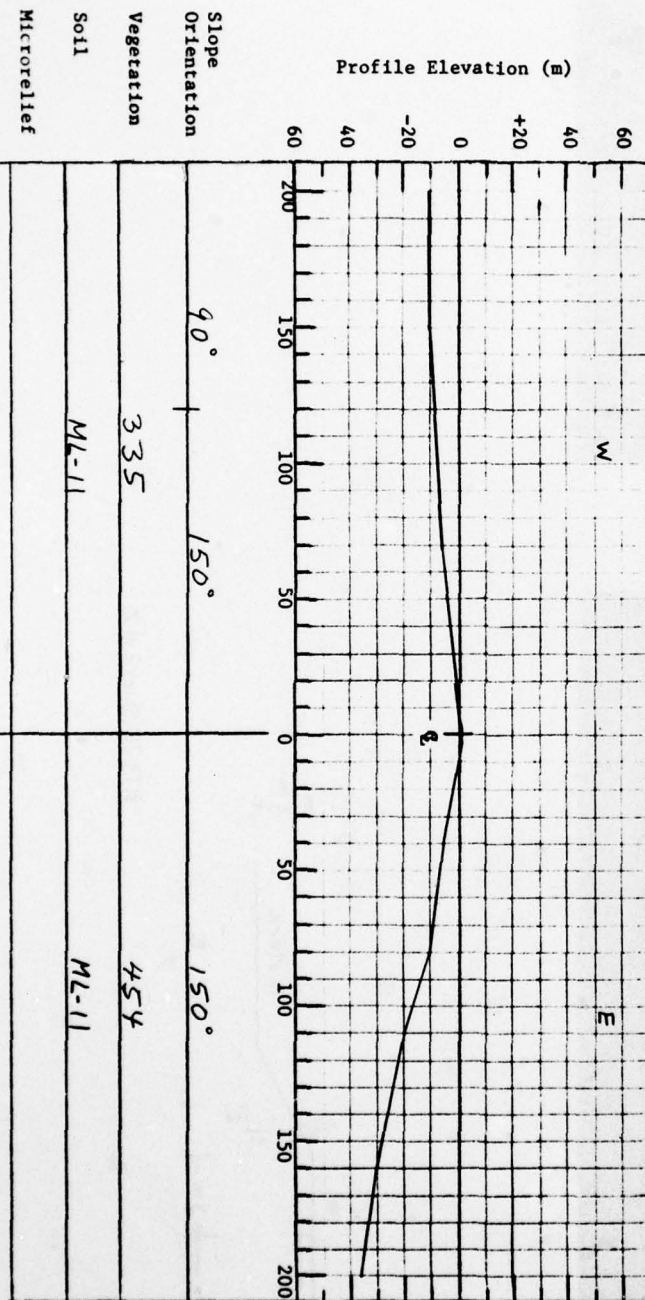
Construction:

Traffic Surface				Shoulder	
Width (m)  * 2.05	Surface	Material	Thick (cm)	Width (m)	Material
	Base	Metalled			
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.

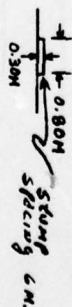
Horizontal Distance (m)

\* from field observation, Aug 1974



SITE 77 - PROFILE DATA

AL18



Sample Number: 78

Date: 9 Sept 74

Notes and Comments:

Map Number: 5C23

Scale: 1:25000

Coordinate Location:

Geographic: 50°21'00"N UTM Ref.:  
09°35'18"E

Landscape: forested and  
cultivated hillsides

Road: Class: 5

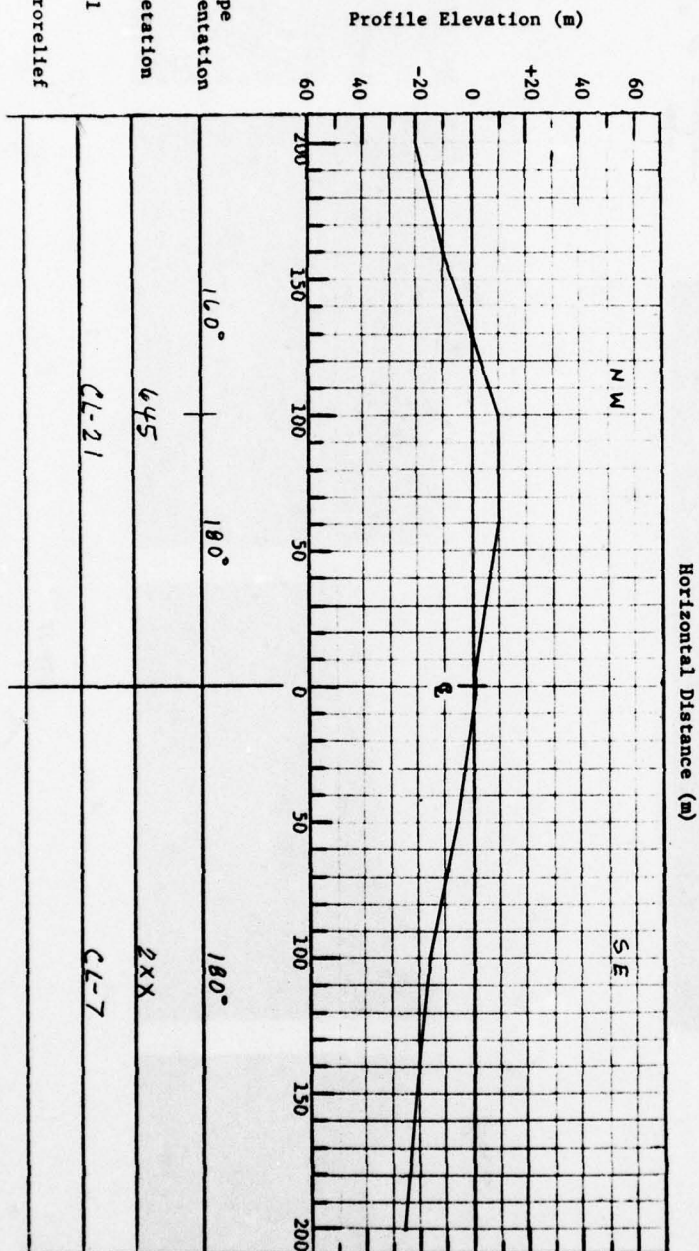
Direction: NE

Site Type: 2

Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction: On transect profile sketch show  
location of important features,  
such as stream crossings, ditches,  
etc.



SITE 78 - PROFILE DATA

AL20







Sample Number: 80

Date: 9 Sept 74

Map Number: 5625

Scale: 1:25000

**Coordinate Location:**

Geographic: 50° 21' 24" N UTM Ref.:

Landscape: Pasture and forested hill side

09° 55' 00" E

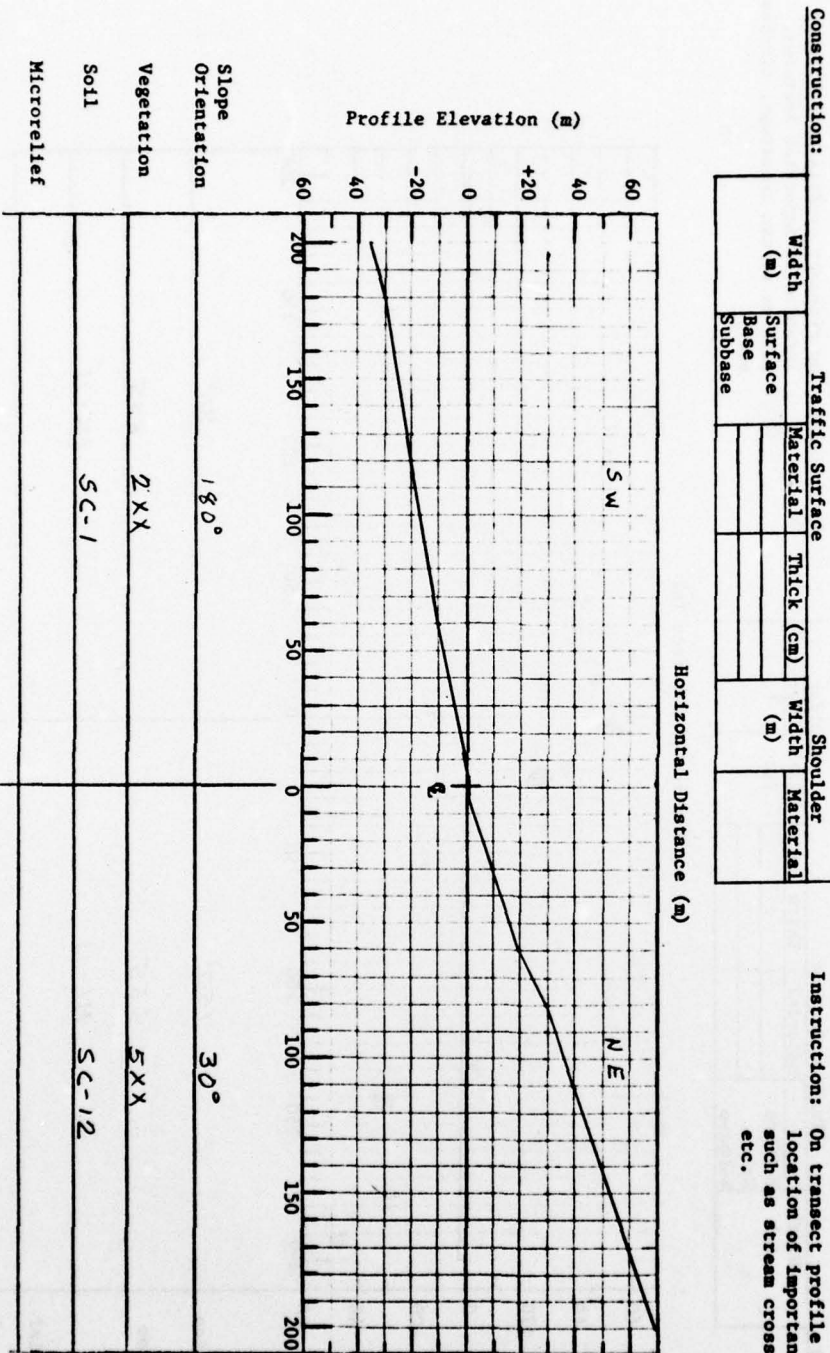
Road: Class: 5

**Direction:** NW

Site Type: 5

**Notes and Comments:**

**Instruction:** On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



SITE 80 - PROFILE DATA

A122

Sample Number: 81

Date: 9 Sept 74

Notes and Comments:

Map Number: 5625

Scale: 1:25000

Coordinate Location:

Geographic: 50°22'34"N UTM Ref.:

Landscape: Pasture flood

09°55'00"E

Road: Class: 3

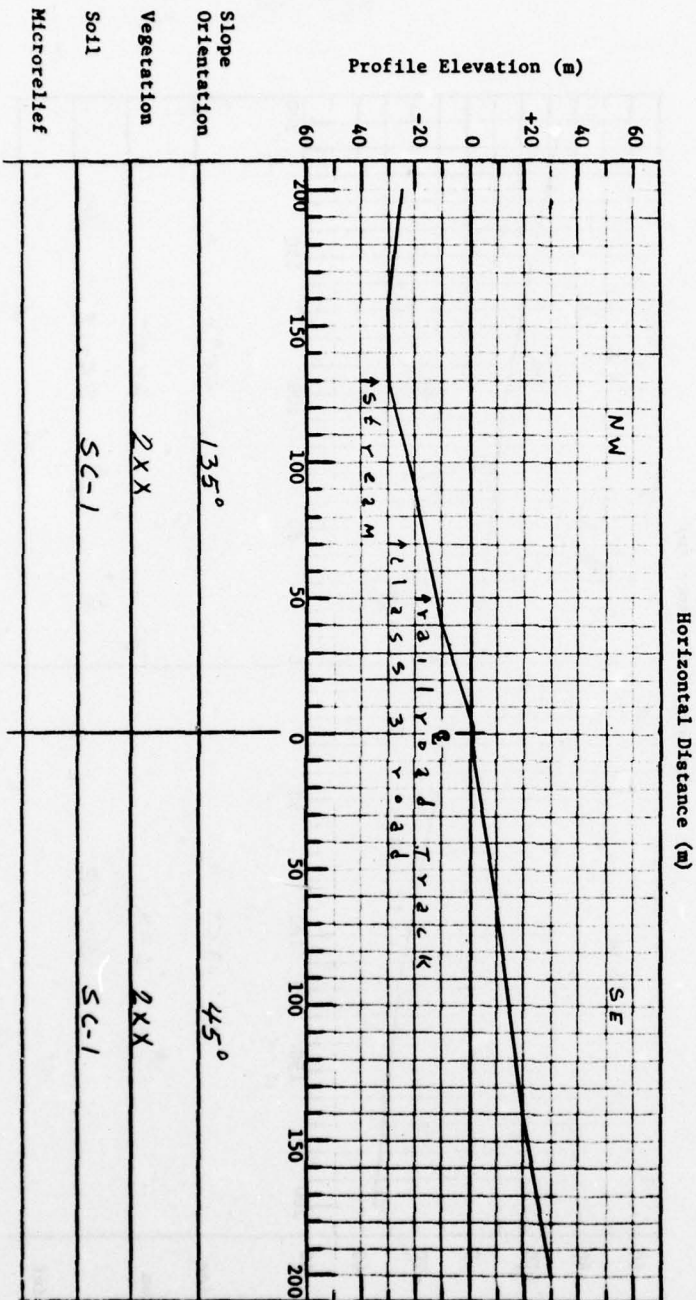
Direction: NE

Site Type: 3/4

Construction:

Width (m)	Traffic Surface		Shoulder	
	Surface	Material	Thick (cm)	Material
	Base			
	Subbase			

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



SITE 81 - PROFILE DATA

AL23

Sample Number: 82

Date: 9 Sept 74

Map Number: 5625

Scale: 1:25000

Coordinate Location:

Geographic: 50°22'13"N UTM Ref.:

Landscape: Forested hillside

09°55'00"E

Road: Class: 4

Direction: NW

Site Type: 4

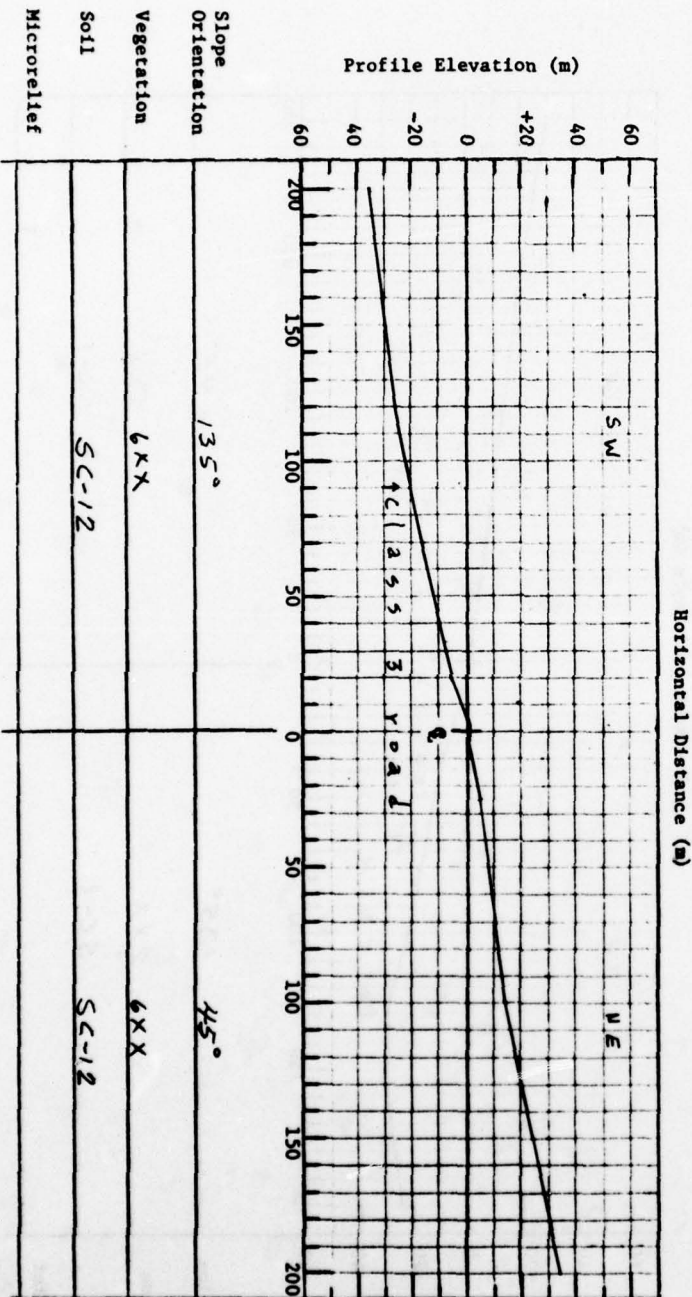
Notes and Comments:



Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



SITE 82 - PROFILE DATA

A124



Sample Number: 83

Date: 9 Sept 74

Notes and Comments:

Map Number: 2591C

Scale: 1:50000

Coordinate Location:

Geographic: 50°09'18"N UTM Ref.:

Landscape: cultivated plain

08°35'00"E

Road: Class: 4

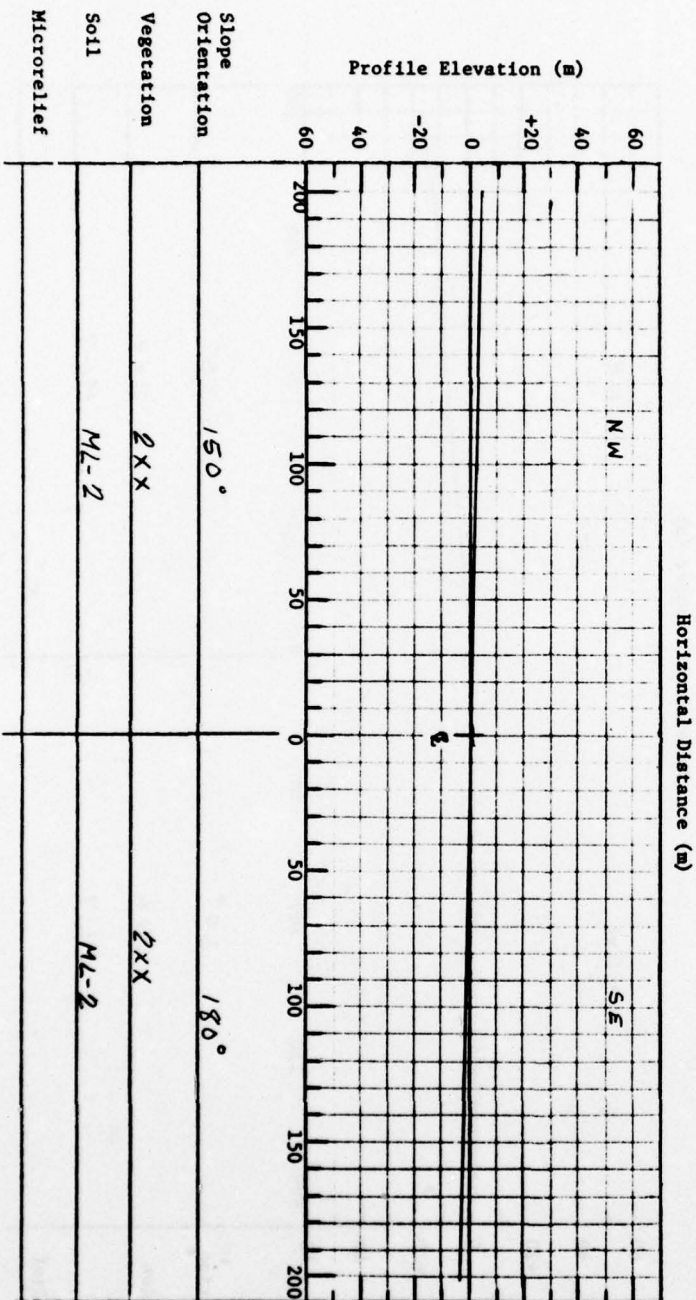
Direction: NE

Site Type: 1

Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



SITE 83 - PROFILE DATA

A125



Sample Number: 84

Date: 4 Sept 74

Notes and Comments:

Map Number: 254/1

Scale: 1:50000

Coordinate Location:

Geographic: 50°09'34"N UTM Ref.:

Landscape: *Cultivated valley floor*

08°35'00"E

Road: Class: 5

Direction: NW

Site Type: 1/4

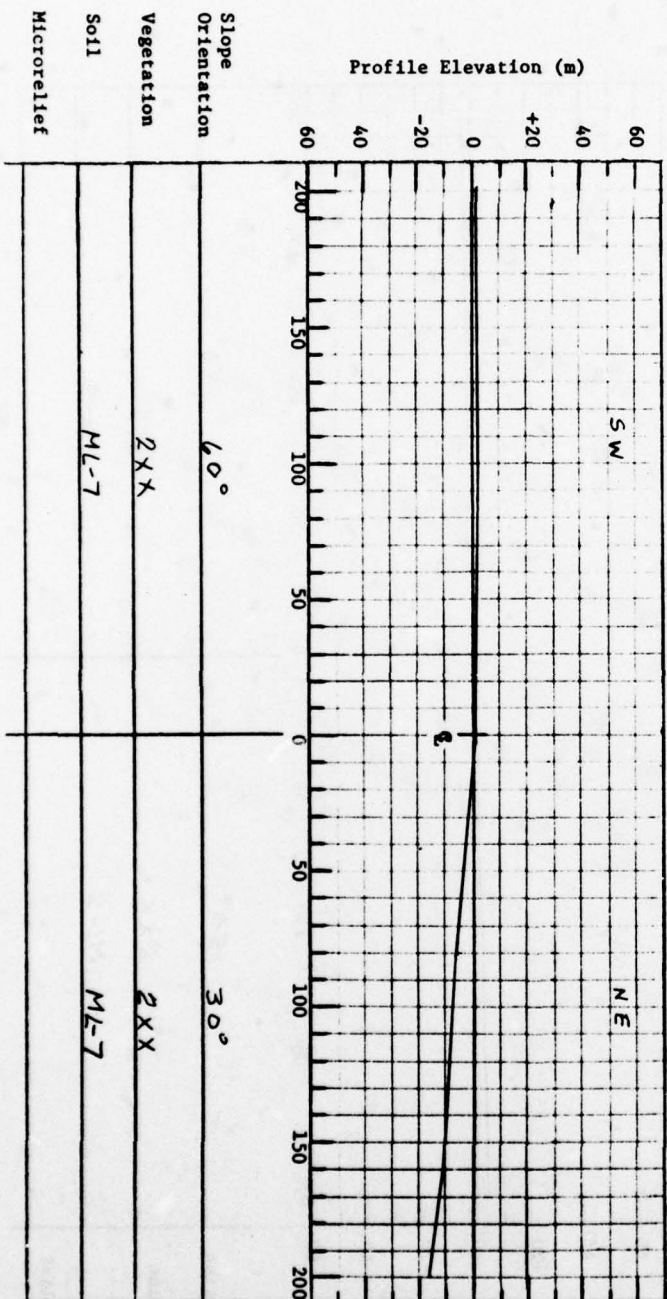
Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick. (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



Horizontal Distance (m)



SITE 84 - PROFILE DATA

A126

Sample Number: 85

Date: 4 Sept 74

Notes and Comments:

Map Number: 45916

Scale: 1:50000

Coordinate Location:

Geographic: 50°0'18"N UTM Ref.:  
08°35'00"E

Landscape: Orchard and  
cultivated valley floor

Road: Class: 3

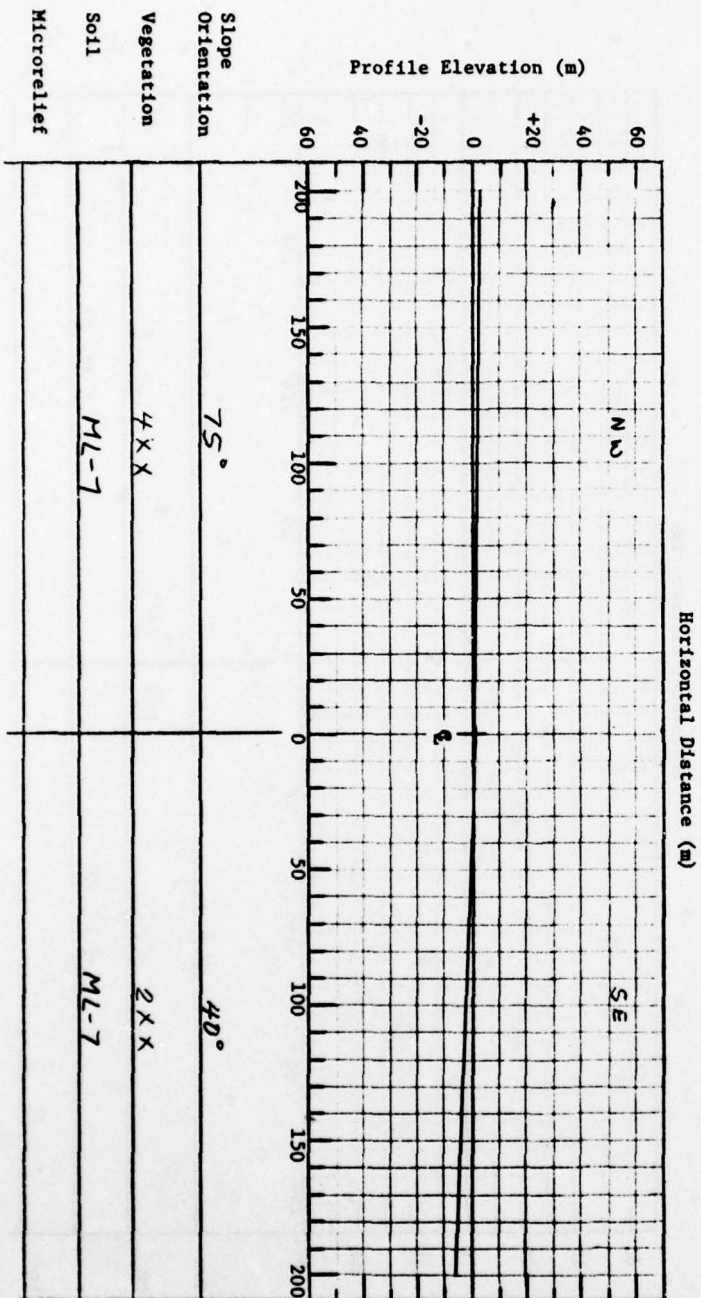
Direction: NE

Site Type: 1

Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction: On transect profile sketch show  
location of important features,  
such as stream crossings, ditches,  
etc.



SITE 85 - PROFILE DATA

AL27

Sample Number: 86

Date: 10 Sept 74

Notes and Comments:

Map Number: L5918

Scale: 1:50000

Coordinate Location:

Geographic: 50°09'14"N UTM Ref.:

Landscape: *Asfurc*  
*valley floor*

08°55'23"E

Road: Class: 2

Direction: E

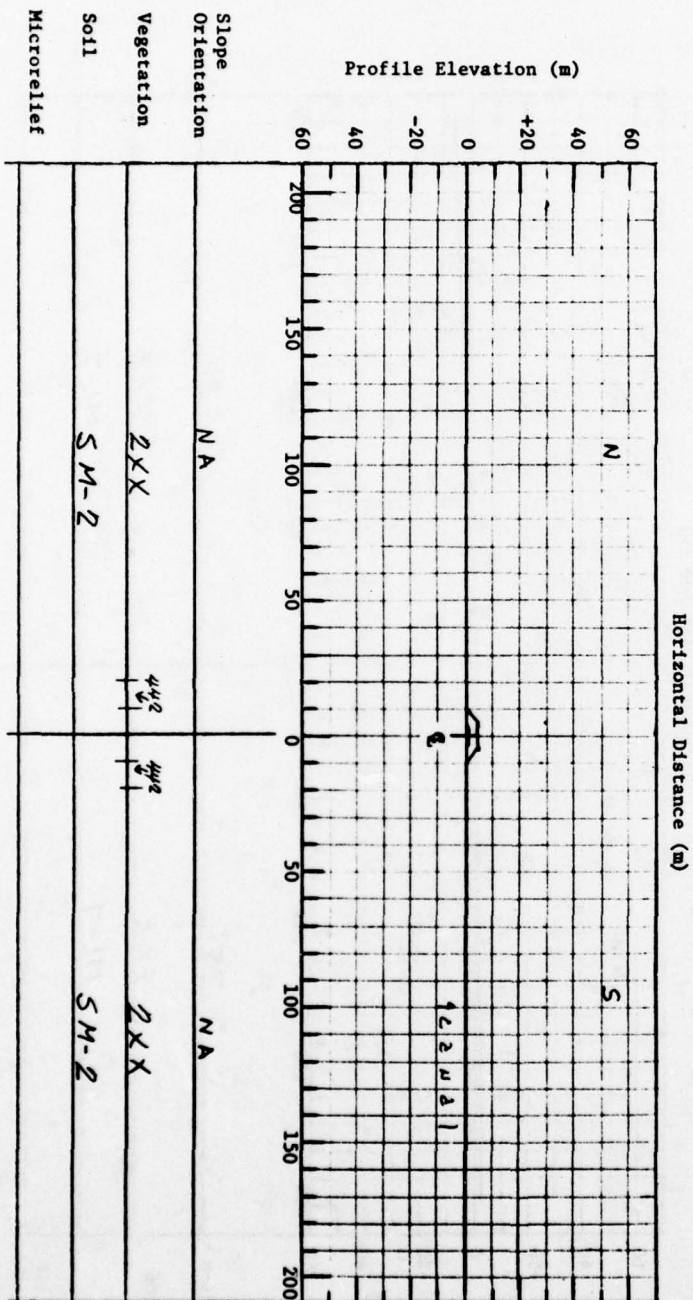
Site Type: 1



Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



SITE 86 - PROFILE DATA

AL28



Sample Number: 87

Date: 10 Sept 74

Notes and Comments:

Map Number: 25918

Scale: 1:50000

Coordinate Location:

Geographic: 50°09'23"N UTM Ref.:

Landscape: Forested

08°55'40"E

Road: Class: 4

Direction: N

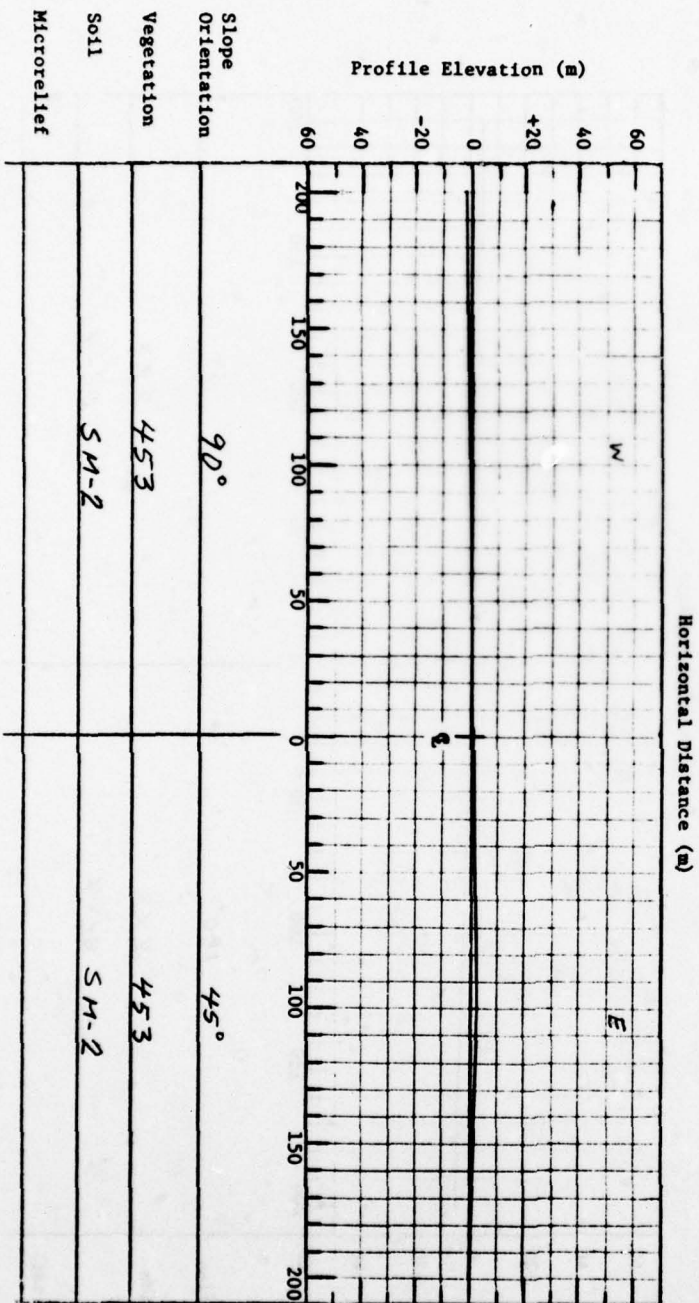
Site Type: 1



Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



SITE 87 - PROFILE DATA

AL29



Sample Number: 88

Date: 10 Sept 74

Notes and Comments:

Map Number: 15418

Scale: 1:50000

Coordinate Location:

Geographic: 50°10'40"N UTM Ref.:  
08°57'50"E

Landscape: *Quaternary  
lowland*

Road: Class: 3

Direction: NW

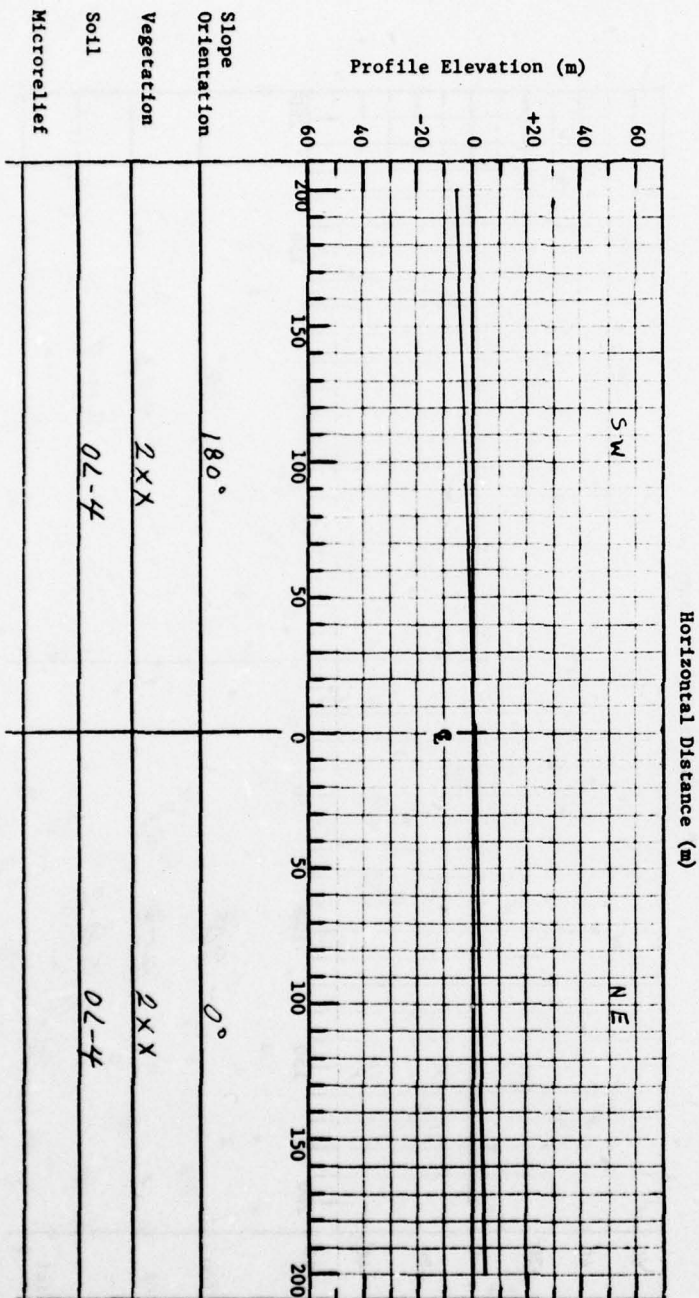
Site Type: 4



Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface Base	Material	Thick (cm)	Width (m)	Material
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



SITE 88 - PROFILE DATA

A130



Sample Number: 90

Date: 10 Sept 74

Notes and Comments:

Map Number: L5920

Scale: 1:50000

Coordinate Location:

Geographic: 50°04'00"N UTM Ref.:  
0915134"E

Landscape: forested  
and cultivated hillslope

Road: Class: 5

Direction: NE

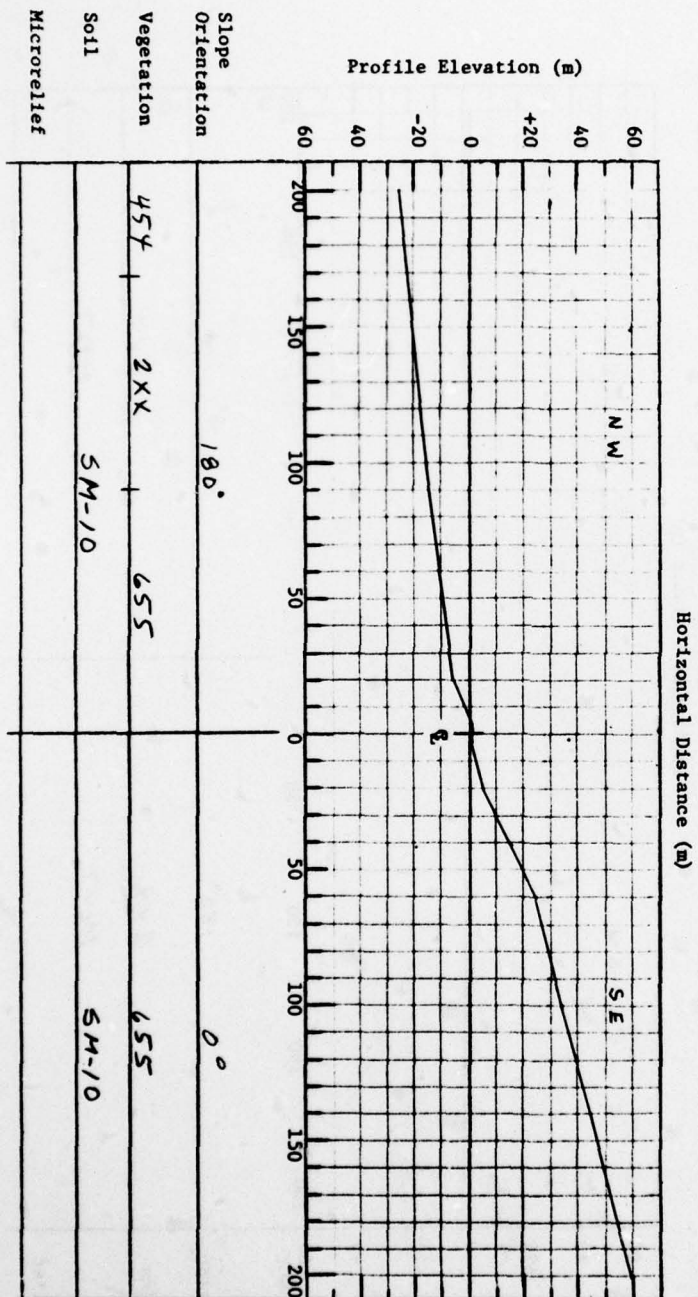
Site Type: 4



Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction: On transect profile sketch show  
location of important features,  
such as stream crossings, ditches,  
etc.



SITE 90 - PROFILE DATA

A132

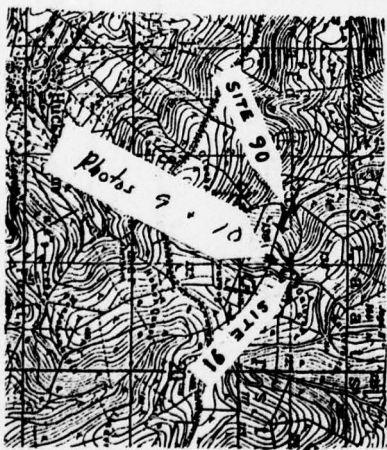
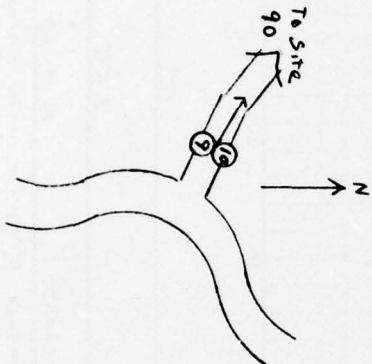




9

10

Selected site is inaccessible. Photographs are at 50°08'55"N, 09°15'55"E (UTMG coordinates 189 553) on the same road or the same road system, just off the main road from Site 91. (No field profile detail.)



SITE 90

AL33



Sample Number: 91

Date: 10 Sept 74

Map Number: L5920

Scale: 1:50000

Coordinate Location:

Geographic: 50°09'00"N UTM Ref.:

Landscape: Forested hillside

09°16'03"E

Road: Class: 4

Direction: N

Site Type: 4

Notes and Comments:



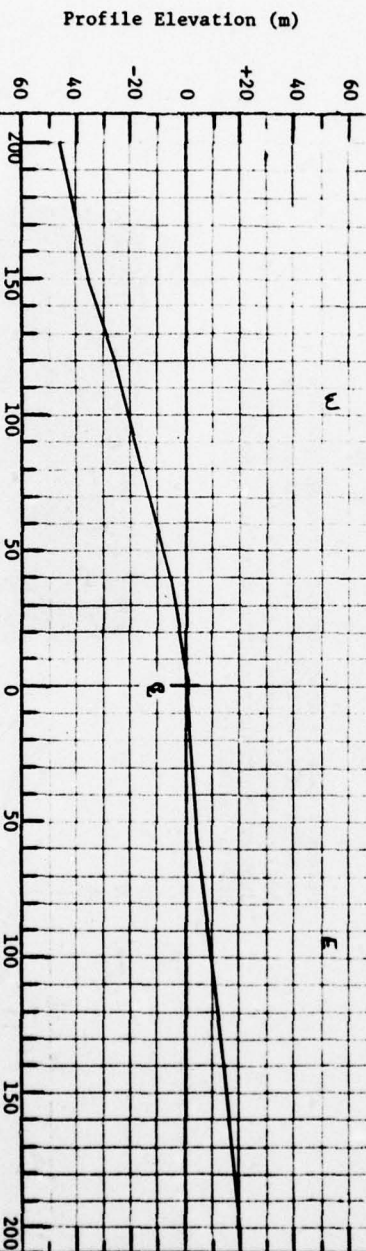
Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
* 2 parallel strips	X	Concrete			
	Base				
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.

Horizontal Distance (m)

\* field observation Aug 1974



Slope  
Orientation

180°

0°

Vegetation

SSS

SSS

Soil

SM-10 (\*Stony Sandy loam)

SM-10

Microrelief

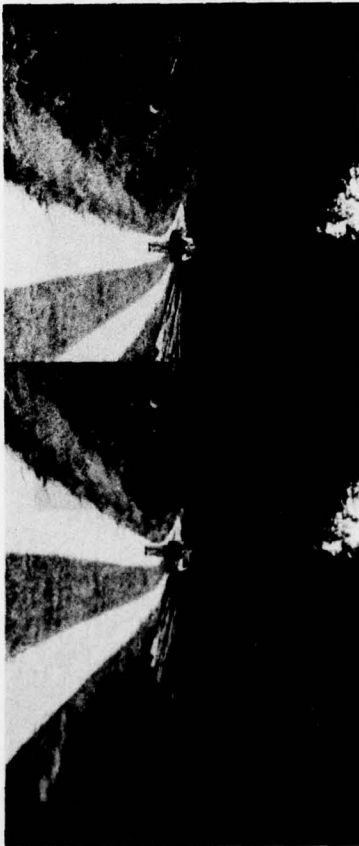
\* Many stones less than 15 cm diam. \* Surface irregular, with mounds 20 cm high spaced 4 m apart, both sides.

SITE 91 - PROFILE DATA

AL34

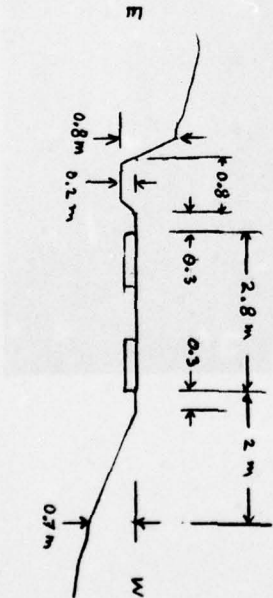
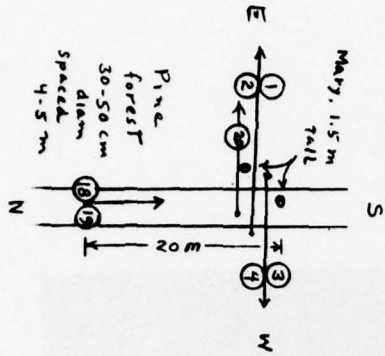


20



18

19



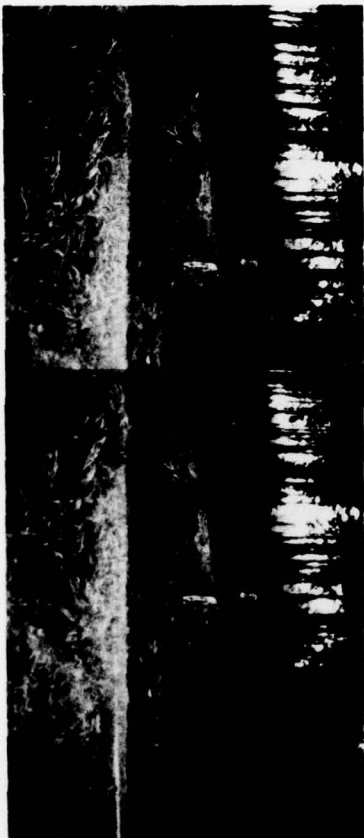
SITE 91 (Sheet 1 of 2)

AL35



3

4



2

1

SITE 91 (Sheet 2 of 2)

AL 36

Sample Number: 92

Date: 10 Sept 74

Notes and Comments:

Map Number: L5922

Scale: 1:50000

Coordinate Location:

Geographic: 50°09'04"N UTM Ref.: 09°35'00"E

Landscape: forested  
and cultivated valley

Road: Class: 3

Direction: NE

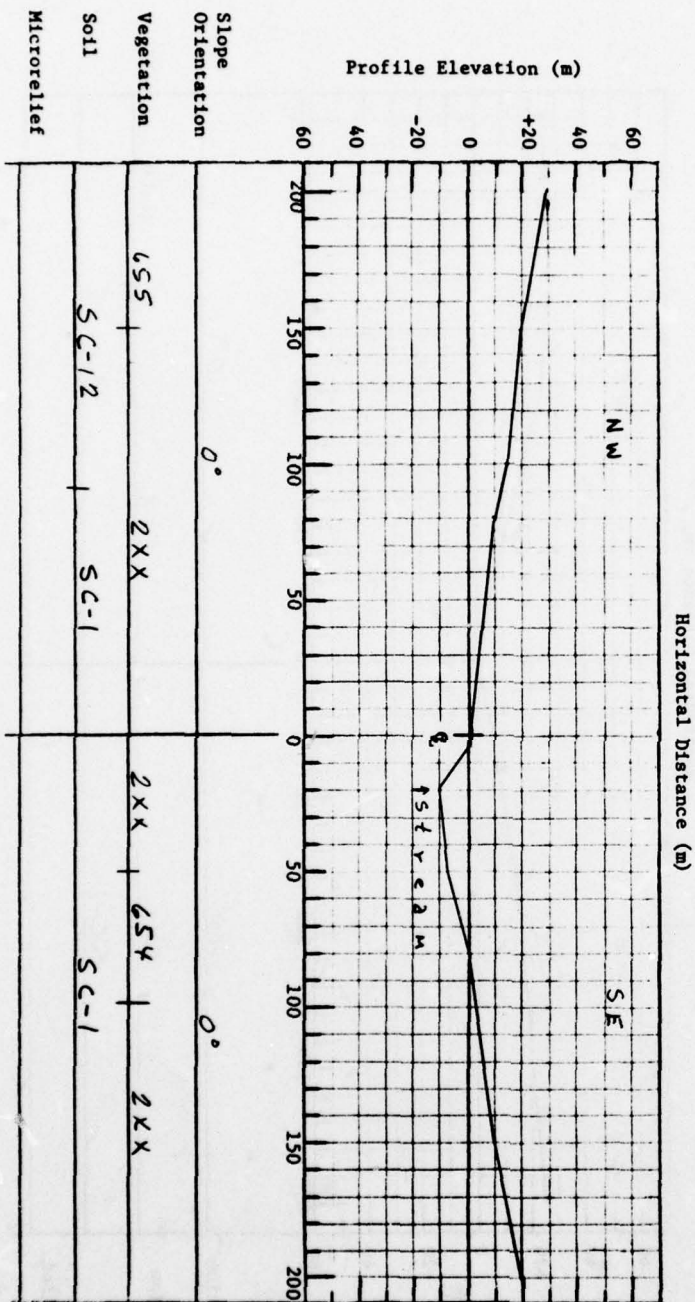
Site Type: 3

Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width	Material
	Base				
	Subbase				

Instruction:

On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



SITE 92 - PROFILE DATA

AL37



Sample Number: 93

Date: 10 Sept. 74

Map Number: L5922

Scale: 1:50000

Coordinate Location:

Geographic: 50°09'28"N UTM Ref.:  
09°35'00"E

Landscape: Forested  
and cultivated valley

Road: Class: 5

Direction: NW

Site Type: 3

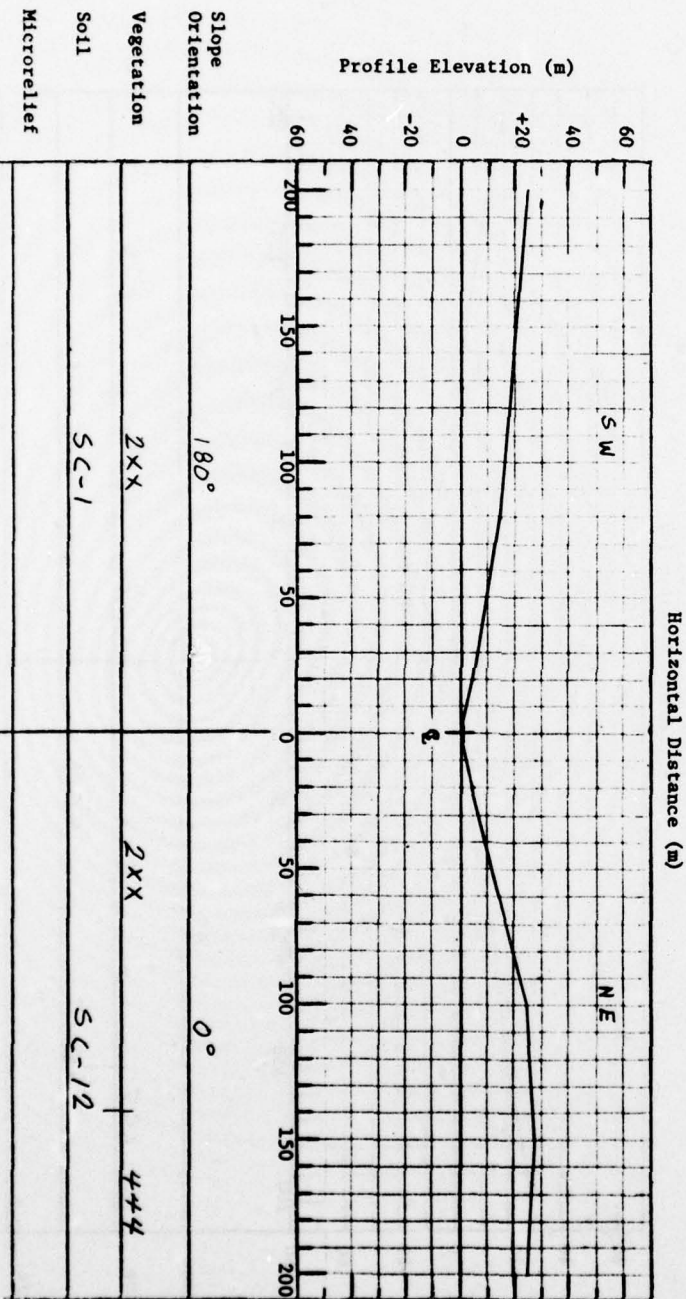
Notes and Comments:



Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction: On transect profile sketch show  
location of important features,  
such as stream crossings, ditches,  
etc.



SITE 93 - PROFILE DATA

AL36

Sample Number: 94

Date: 10 Sept 74

Notes and Comments:

Map Number: 25922

Scale: 1:50000

Coordinate Location:

Geographic: 50°10'41"N UTM Ref.:  
09°35'00"E

Landscape: Cultivated  
and forested lowland

Road: Class: 4

Direction: NW

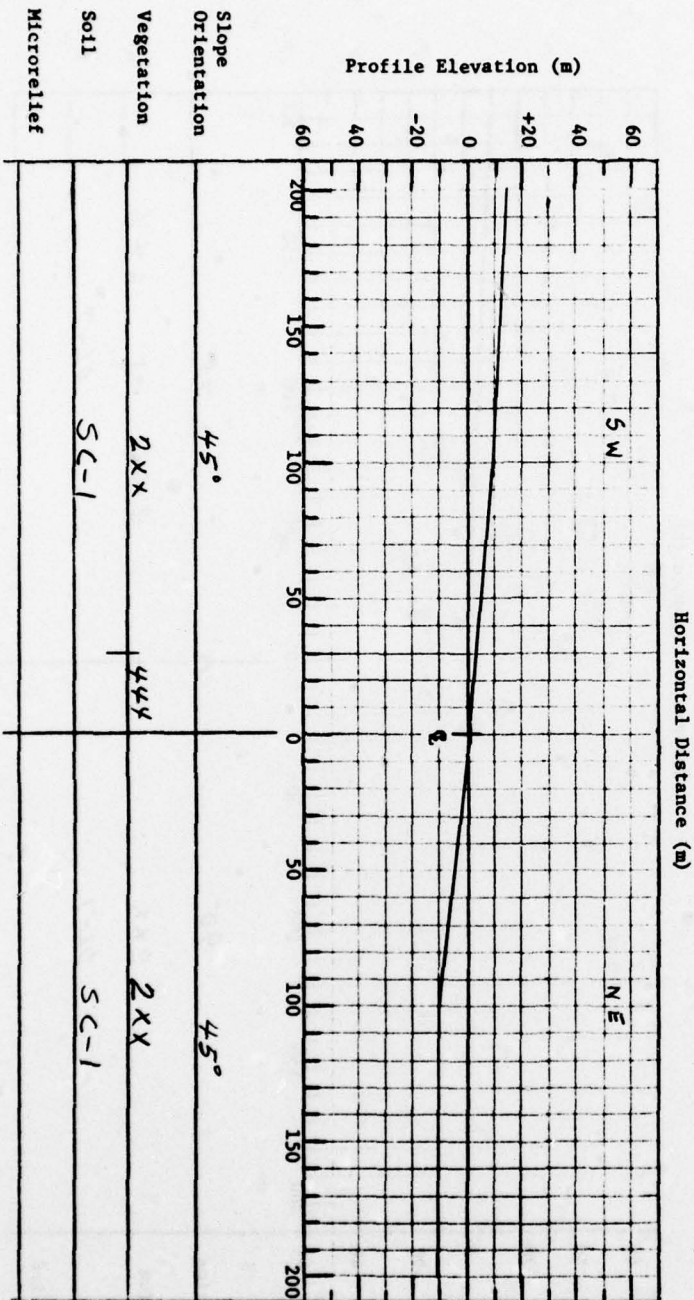
Site Type: 4



Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction: On transect profile sketch show  
location of important features,  
such as stream crossings, ditches,  
etc.



SITE 94 - PROFILE DATA

AL39

Sample Number: 95

Date: 10 Sept 74

Notes and Comments:

Map Number: L5924

Scale: 1:50000

Coordinate Location:

Geographic: 50°09'10"N UTM Ref.:  
09°55'22"E

Landscape: Cultivated  
and forested hills

Road: Class: S

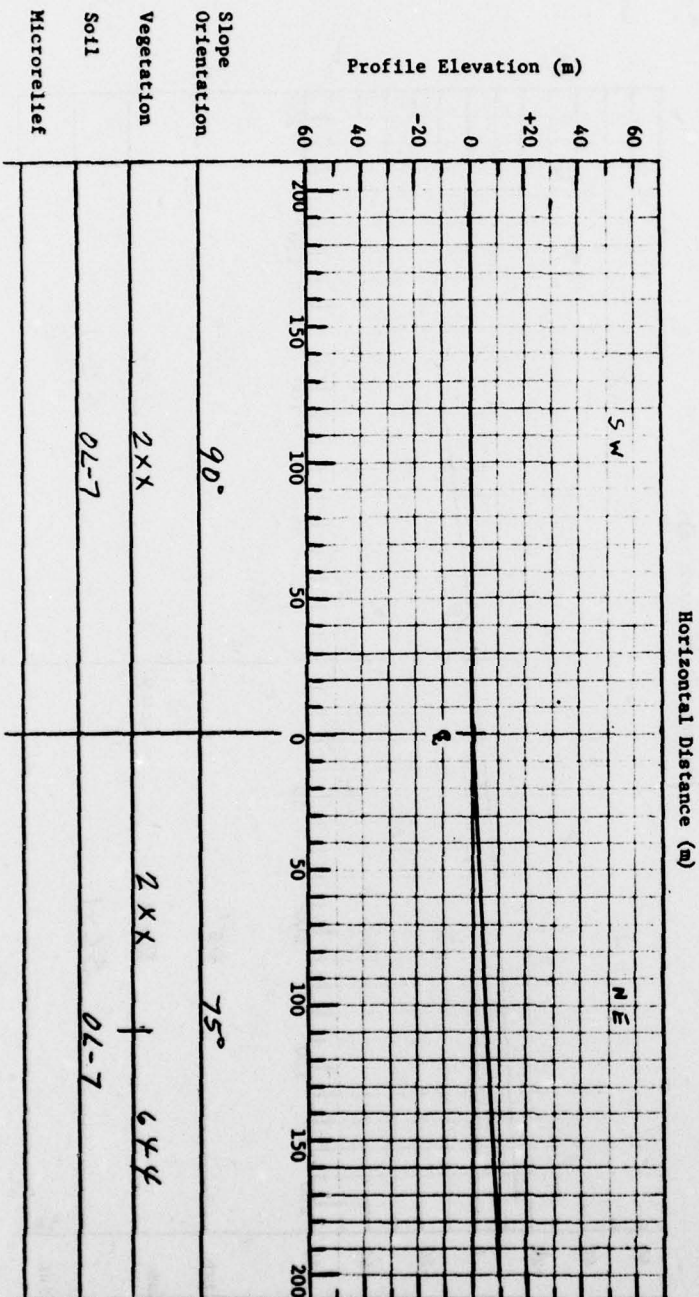
Direction: NW

Site Type: 1/4

Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction: On transect profile sketch show  
location of important features,  
such as stream crossings, ditches,  
etc.



SITE 95 - PROFILE DATA

AL40



Sample Number: 96

Date: 10 Sept 74

Map Number: L 5924

Scale: 1:50000

Coordinate Location:

Geographic: 50°10'23"N UTM Ref.:

Landscape: Forested upland

09°57'22"E

Road: Class: 4

Direction: NW

Site Type: 4

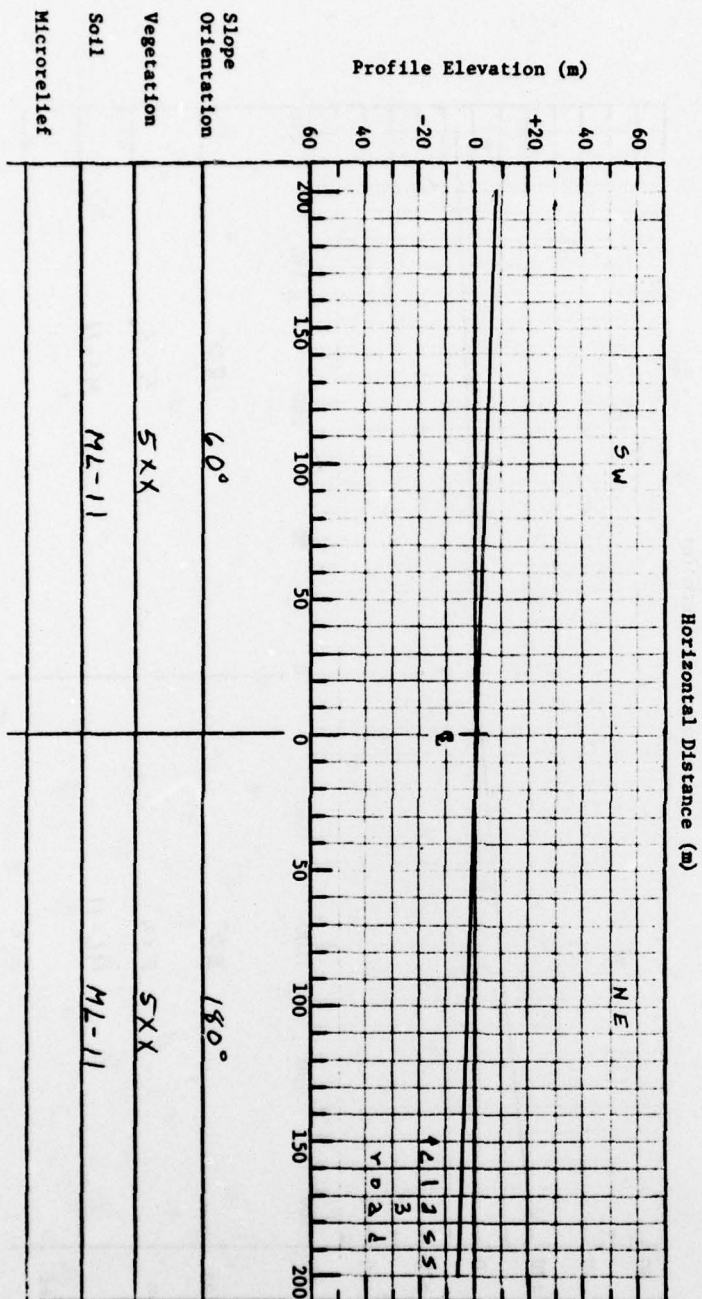
Notes and Comments:



Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



SITE 96 - PROFILE DATA

ALH1



Sample Number: 97

Date: 10 Sept 74

Map Number: L5924 Scale: 1:50000

Coordinate Location: Geographic: 50°10'36"N UTM Ref.: 09°57'25"E

Landscape: Forested upland

Road: Class: 3 Direction: N Site Type: 4

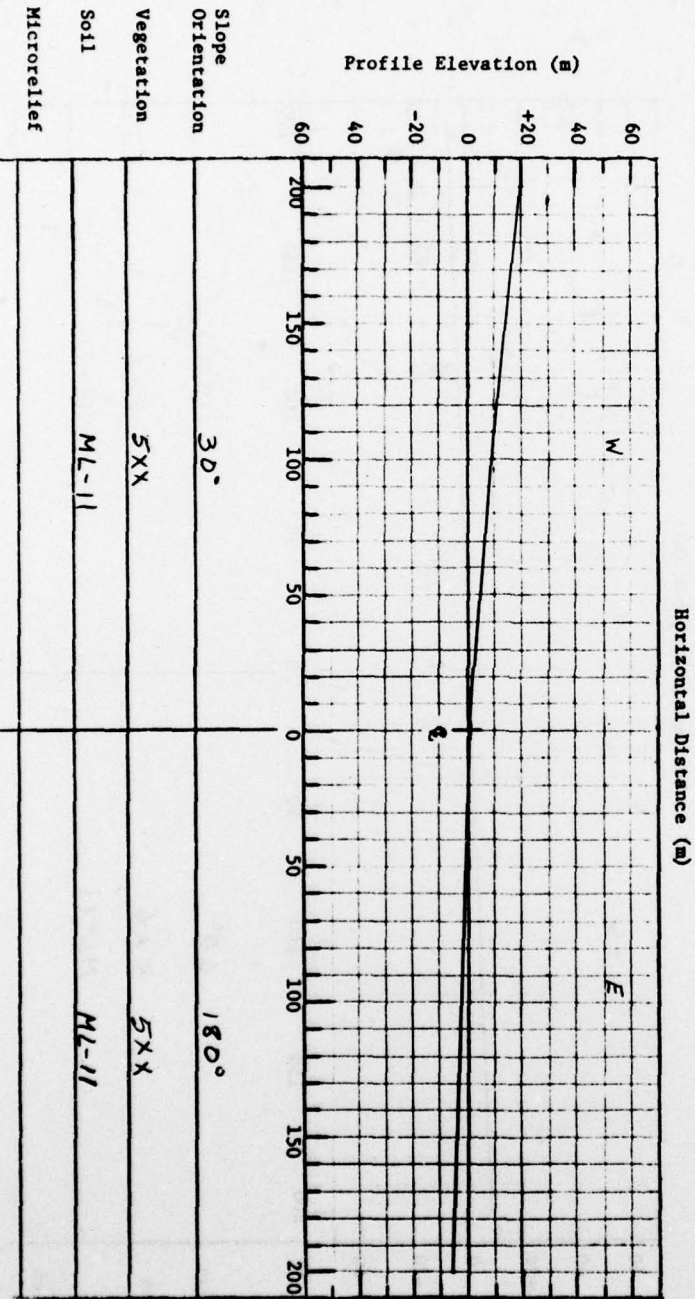
Notes and Comments:



Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



SITE 97 - PROFILE DATA

AL42

Sample Number: 98

Date: 10 Sept 74

Map Number: L5924

Scale: 1:50000

Coordinate Location:

Geographic: 50°10'34"N UTM Ref.:  
09°57'46"E

Landscape: Forested upland

Road: Class: 1

Direction: NW

Site Type: 1

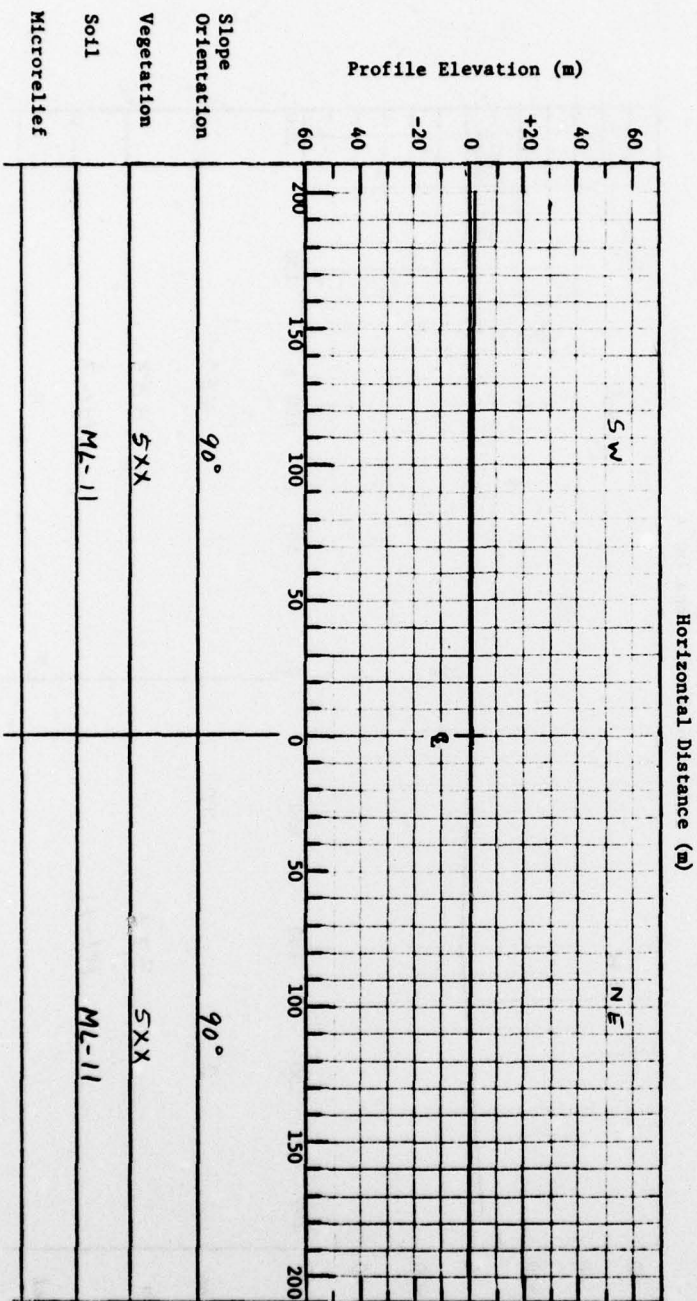
Notes and Comments:



Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width	Material
	Base			(m)	
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



SITE 98 - PROFILE DATA

AL43

Sample Number: 99

Date: 10 Sept 74

Notes and Comments:

Map Number: 25924

Scale: 1:50000

Coordinate Location:

Geographic: 50°10'17"N UTM Ref.:  
09°58'50"E

Landscape: Shrub-covered  
upland

Road: Class: 2

Direction: NW

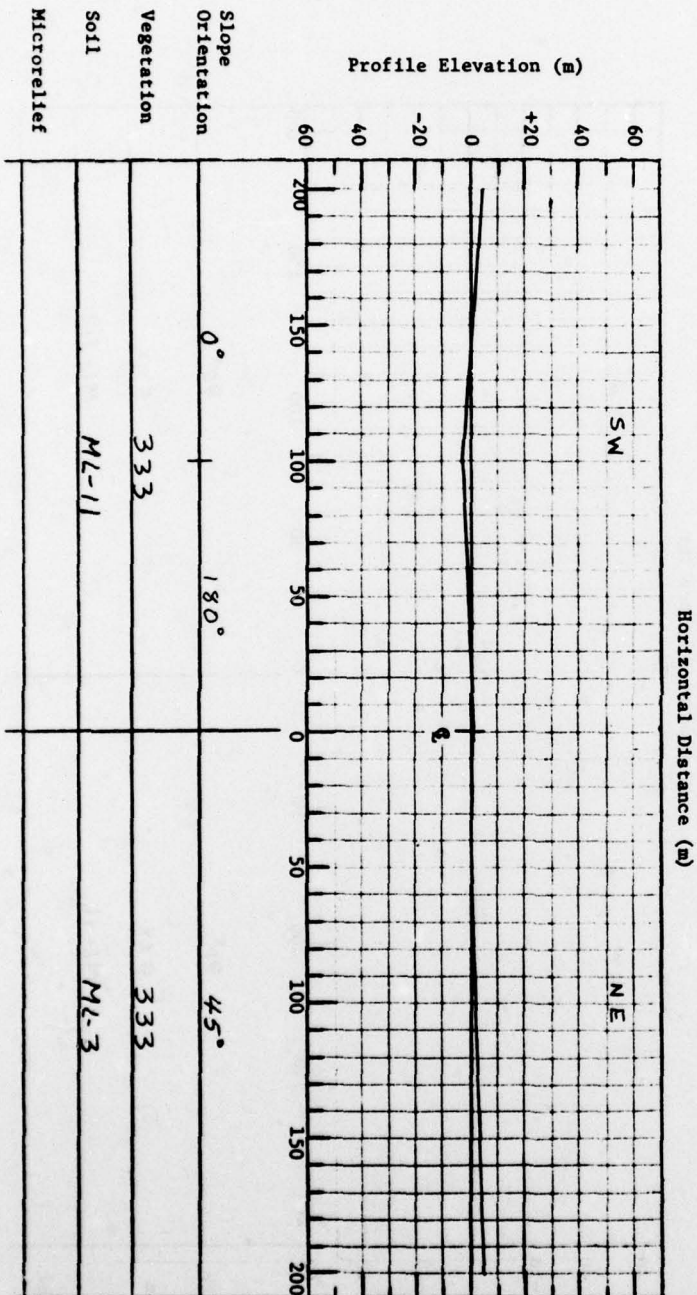
Site Type: 3/4

Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction:

On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



SITE 99 - PROFILE DATA

AL44



Sample Number: 100

Date: 10 Sept 74

Notes and Comments:

Map Number: L 6118

Scale: 1:50000

Coordinate Location:

Geographic: 50°57'37"N UTM Ref.: 08°55'00"E

Landscape: Cultivated  
and forested valley floor

Road: Class: 5

Direction: NE

Site Type: 1

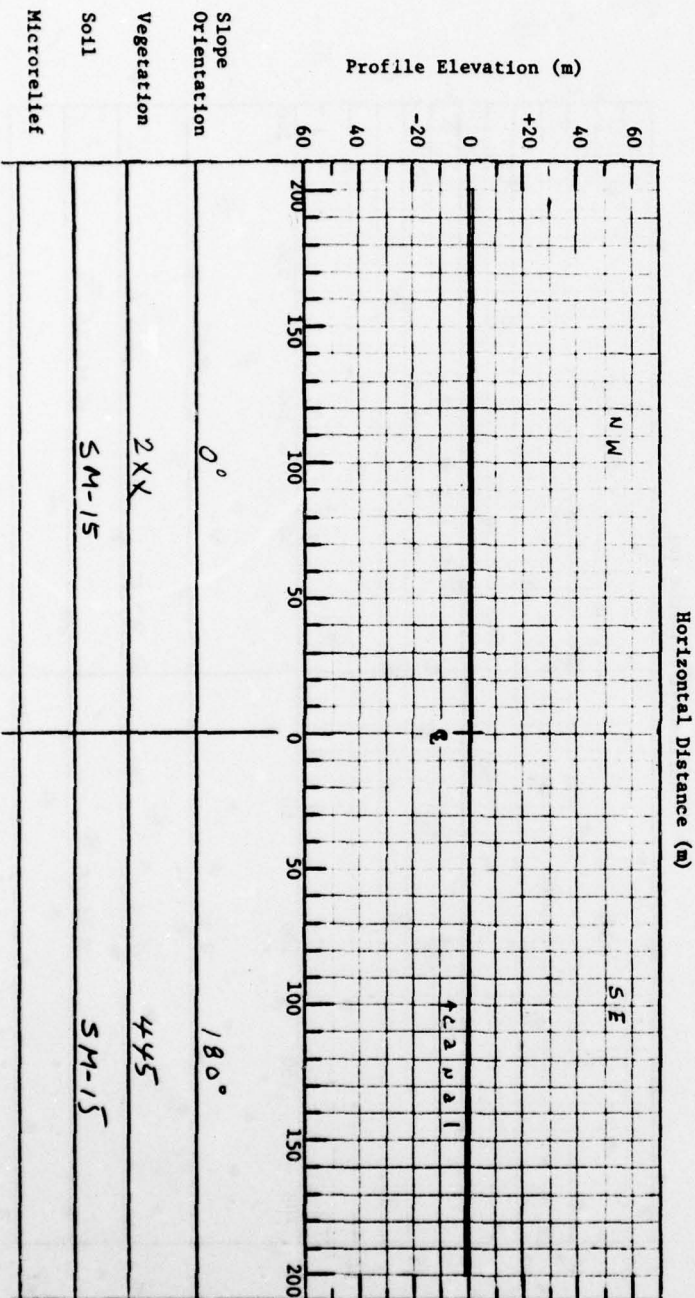


Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction:

On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



SITE 100 - PROFILE DATA

AL45



Sample Number: 101

Date: 10 Sept 74

Map Number: LC118

Scale: 1:50000

Coordinate Location:

Geographic: 50°57'20"N UTM Ref.:  
08°55'00"E

Landscape: Cultivated  
and wooded lowland

Road: Class: 2

Direction: NW

Site Type: 1

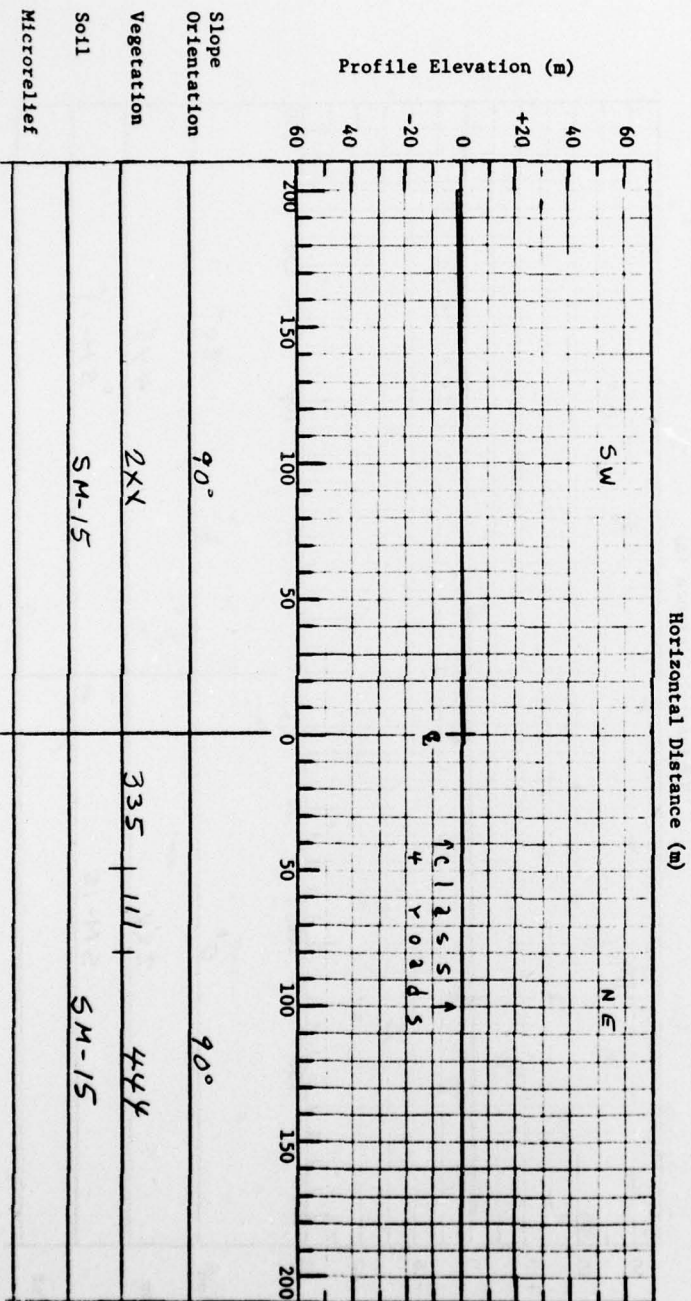
Notes and Comments:



Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width	Material
	Base				
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



SITE 101 - PROFILE DATA

AL46

Sample Number: 102

Date: 10 Sept 74

Map Number: L6118

Scale: 1:50000

Coordinate Location:

Geographic: 50°59'40"N UTM Ref.:

Landscape: Shrub-covered  
lowland

08°55'00"E

Road: Class: 4

Direction: NW

Site Type: 1

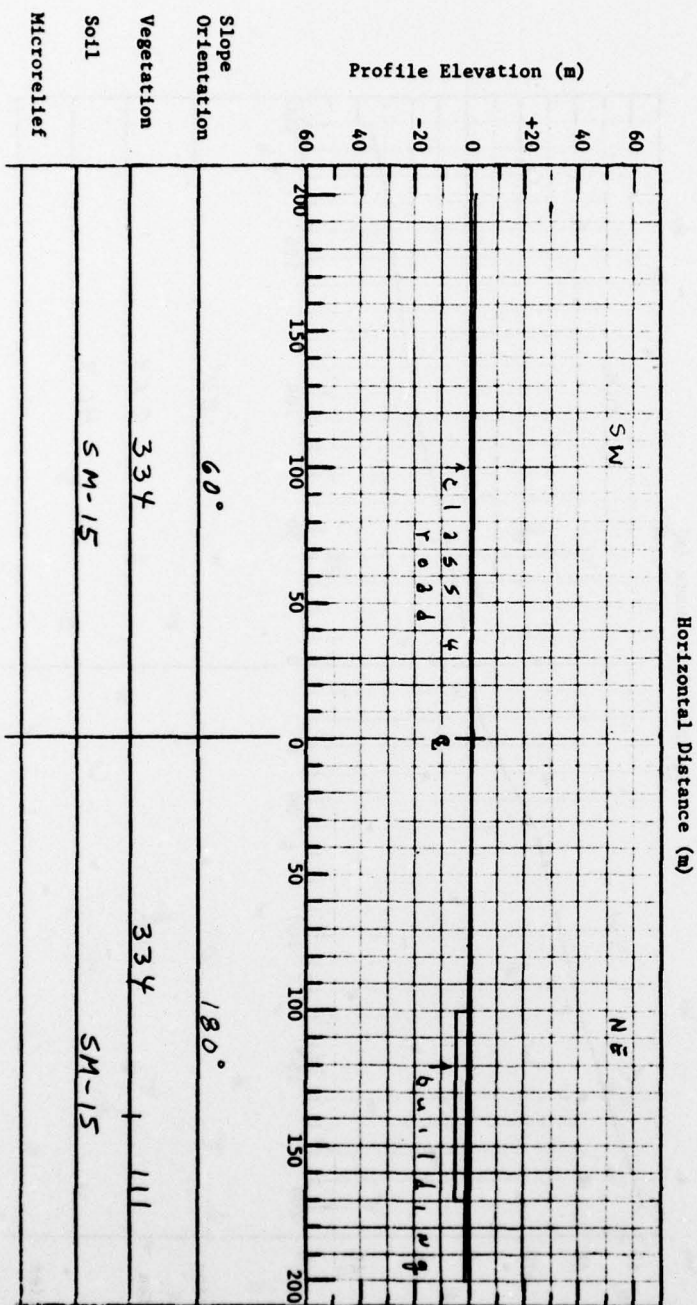
Notes and Comments:



Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



SITE 102 - PROFILE DATA

AL47

Sample Number: 103

Date: 10 Sept 74

Map Number: L 6/20

Scale: 1:50000

Coordinate Location:

Geographic: 49°57'38"N UTM Ref.:

Landscape: Forested and  
cultivated hillside

09°16'03"E

Road: Class: 5

Direction: NW

Site Type: 5

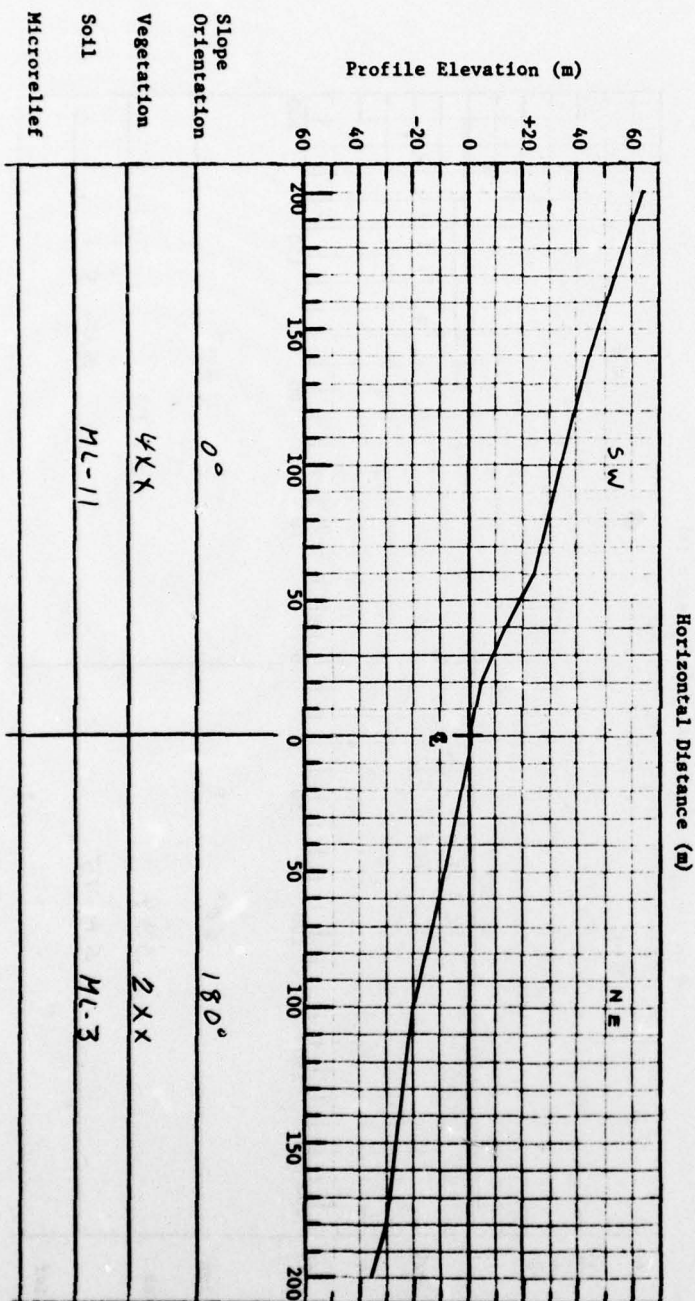
Notes and Comments:



Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



SITE 103 - PROFILE DATA

A248



Sample Number: 104

Date: 10 Sept 74

Notes and Comments:

Map Number: L 6120 Scale: 1:50000

Coordinate Location: Geographic: 49°58'24"N UTM Ref.: 09°17'20"E

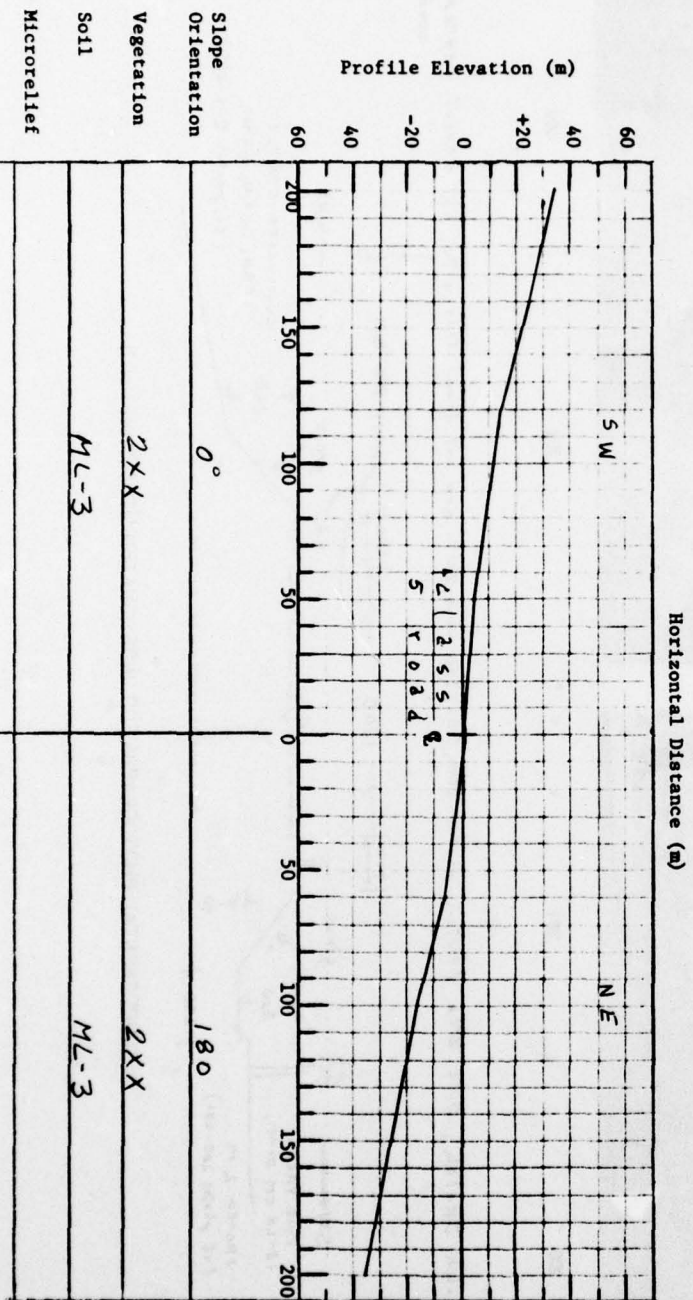
Landscape: Cultivated hillside

Road: Class: 1 Direction: NW Site Type: 3/4

Construction:

Width (m)	Traffic Surface			Shoulder	
	Surface	Material	Thick (cm)	Width (m)	Material
	Base				
	Subbase				

Instruction: On transect profile sketch show location of important features, such as stream crossings, ditches, etc.



SITE 104 - PROFILE DATA

A149





200

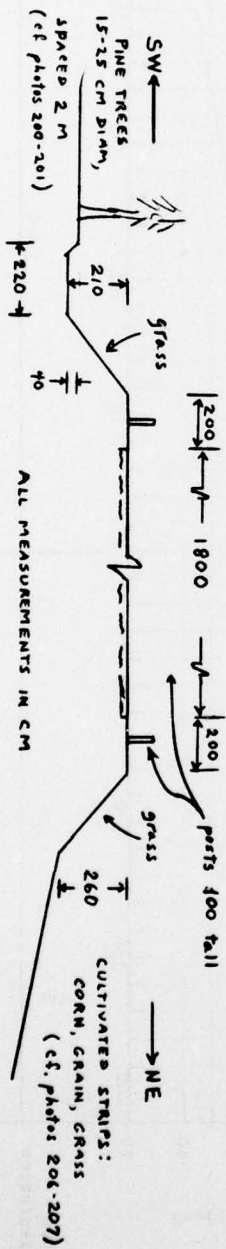


201

202

203

Profile Sketch, site 29. (Note: photos 200, 201, 206 and 207 are not from this site, but depict representative conditions.)

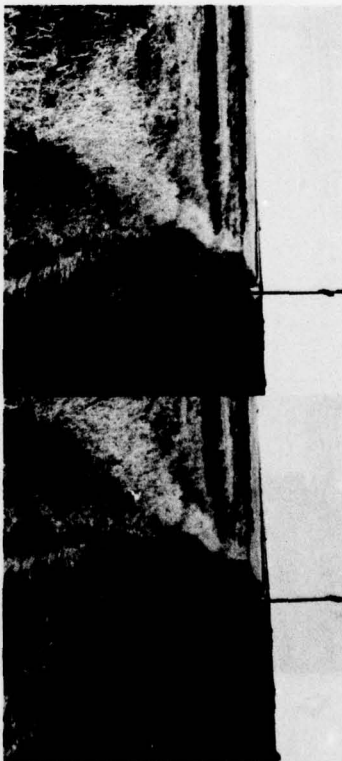


SUPPLEMENTAL PHOTOGRAPHS FOR UNDESIGNATED SITES (Sheet 1 of 3)



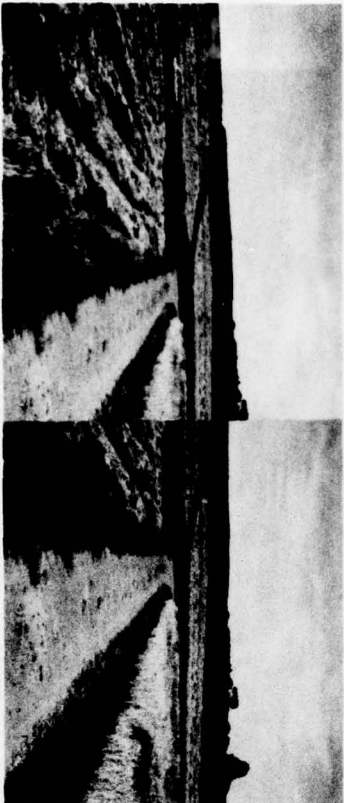
204

205



206

207



208



209



210



211

SUPPLEMENTAL PHOTOGRAPHS FOR UNDESIGNATED SITES (Sheet 2 of 3)



25



26



27



31

32

SUPPLEMENTAL PHOTOGRAPHS FOR UNDESIGNATED SITES (Sheet 3 of 3)

In accordance with letter from DAEN-RDC, DAEN-ASI dated 22 July 1977, Subject: Facsimile Catalog Cards for Laboratory Technical Publications, a facsimile catalog card in Library of Congress MARC format is reproduced below.

Addor, Eugene E  
Description of terrain to be used in evaluating the Lofted Mine Concept / by Eugene E. Addor, Edward E. Garrett, Vicksburg, Miss. : U. S. Waterways Experiment Station, 1977. 12, 609, 152 p. : 111. : 27 x 38 cm. (Miscellaneous paper - U. S. Army Engineer Waterways Experiment Station ; M-77-11)  
Prepared for U. S. Army Materiel Systems Analysis Agency, Aberdeen Proving Ground, Maryland, and Office, Chief of Engineers, U. S. Army, Washington, D. C., under Project 4A752730AT42

1. Lofted Mine Concept. 2. Mines (Ordnance). 3. Performance predictions. 4. Terrain. 5. Terrain analysis. 6. Terrain data. I. Garrett, Edward E., joint author. II. United States. Army Materiel Systems Analysis Agency. III. United States. Army. Corps of Engineers. IV. Series: United States. Waterways Experiment Station, Vicksburg, Miss. Miscellaneous paper ; M-77-11.  
FTA7. M34m no M-77-11



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